



ANNALS OF

IMPROBABLE RESEARCH



Special Issue



Chewing Gum

Psycho-Dynamics of Chewing,
Effect of Gum Chewing on Typing,
Chewing Gum and Youths...



*The 24th First Annual
Ig Nobel Prize Ceremony*
Thursday, September 18, 2014 6pm
Sanders Theatre, Harvard University

*Celebrating research that makes
people LAUGH and then THINK.*

Visit www.improbable.com for information
about ticket sales and the live webcast.

Annals of Improbable Research

© 2014 Annals of Improbable Research
ISSN 1079-5146 print / 1935-6862 online



AIR, P.O. Box 380853, Cambridge, MA 02238, USA
"Improbable Research" and "Ig" and the tumbled thinker
logo are all reg. U.S. Pat. & Tm. Off.
617-491-4437 FAX: 617-661-0927



www.improbable.com
subscriptions@improbable.com
EDITORIAL: marc@improbable.com

Research that makes people LAUGH and then THINK



Co-founders
Marc Abrahams
Alexander Kohn



Editor
Marc Abrahams
marc@improbable.com



Bureaus and Desks
Kees Moeliker, European Bureau Chief
Steve Farrar, Edinburgh Desk Chief
Dariusz Jemielniak, Warsaw Desk Chief
Magnus Wahlberg, Scandinavian Desk Chief
Martin Gardiner, Rio de Janeiro Desk Chief
Reto Schneider, Swiss Desk Chief
Sid Rodrigues, London Organiser



Erwin J.O. Kompanje
Willem O. de Jongste



Commutative Editor
Stanley Eigen, Northeastern U.



Associative Editor
Mark Dionne



Dissociative Editor
Rose Fox



Psychology Editor
Robin Abrahams



Contributing Editors
Otto Didact, Stephen Drew, Ernest Ersatz, Emil Filterbag,
Karen Hopkin, Alice Kaswell, Nick Kim, Katherine Lee,
Bissel Mango, Nan Swift, Marina Tshipis, Bertha Vanatian



Research Researchers
Kristine Danowski, Tom Gill, Mary Kroner



Circulation Engineer
Michael Kerpan



Bookmaster
Lauren Maurer Trew



Design and Art
Geri Sullivan, PROMote Communications
Lois Malone, Rich & Famous Graphics



Art Director emerita
Peaco Todd

Improbable Facilitator
Katherine Griffin

WEB TEAM

Editor
Marc Abrahams

Webmaster
Julia Lunetta

*"When all other contingencies fail, whatever remains,
however improbable, must be the truth."
—Sherlock Holmes*

*"Science is the belief in the ignorance of experts."
—Richard Feynman*

CONTENTS

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.



SPECIAL SECTION: CHEWING GUM

- Psycho-Dynamics of Chewing* – Katherine Lee 6
- Some Tentative Cognitive Effects of Chewing Gum* – Katherine Lee 8
- Chewing Gum and Youths* – Katherine Lee 13
- Chewing Gum Research Review* – Katherine Lee 15

Chewing gum and cognitive performance: a case of a functional food with function but no food?

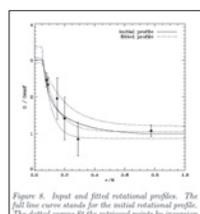
Andrew Scholey

Human Cognitive Neuroscience Unit, Division of Psychology, Northumbria University, Newcastle upon Tyne NE1 3ST, UK
Received 10 June 2004; revised 15 July 2004; accepted 20 July 2004

Abstract

Recent reports suggest that enhancement of memory performance while chewing gum is a fairly robust phenomenon. The processes underlying the effect are not known, but may involve glucose delivery, context-dependent effects and arousal mechanisms amongst others. This brief commentary outlines the main findings from these studies and raises some issues regarding interpretation, methodology and future research directions.

IMPROBABLE RESEARCH REVIEWS*



Page 4

- Improbable Research Review* – Dirk Manley 4
- Improbable Medical Review* – Bertha Vanatian 5
- Improbable Sex* – Marc Abrahams 16
- Soft Is Hard* – Alice Shirrell Kaswell and Bissell Mango 17
- Plucked From Obscurity: Induce Sleep by Restricting Blood Supply to One's Head* – Marina Tsipis 18
- Icky Cutesy Research Review* – Alice Shirrell Kaswell 19
- May We Recommend: Equipment That Cannot Do What We Want – Stephen Drew 20
- Ig® and Beyond: Bees, Fish, Music and Whiskey* – Nan Swift 22
- Boys Will Be Boys* – Katherine Lee 24

Assessing the influence of the multisensory environment on the whisky drinking experience
Carlos Velasco¹, Russell Jones², Scott King³ and Charles Spence^{2*}

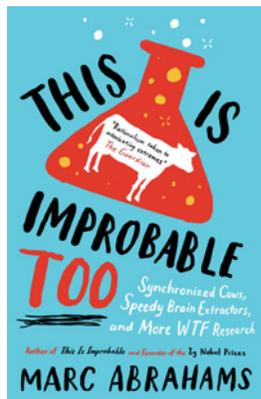
Abstract

Background: Flavour perception depends not only on the multisensory integration of the sensory inputs associated with the food or drink itself, but also on the multisensory attributes (or atmosphere) of the environment in which the food/drink is tasted. We report two experiments designed to investigate whether multisensory atmospheric cues could be used to influence the perception of a glass of whisky that is a complex but familiar product. The present experiment 1) was conducted in the laboratory and involved a sample of 18 participants (12 females, 5 males, and 1 who did not specify gender), while the main study (experiment 2) was conducted at a large restaurant/bar/pub/casino/venue over lunch and dinner, and involved a sample of 443 participants (109 female, 329

Page 23

NEWS & NOTES

- Ig Nobel Prize Ceremony info IFC
- AIR Vents (letters from our readers) 2
- Editorial Board 3



Page 20

- Improbable Research Books 20
- KIM CARTOON: "Pedantic aliens" – Nick Kim 21
- Teachers' Guide 21
- Subscriptions and eBooks for You and Your Colleagues 26

- Ig® Nobel Limericks: Multitudinous Authors, Jerk, and Intestinal Clog* – Martin Eiger 27
- Puzzling Solutions – Emil Filterbag 28
- Index of Special Issues 28
- Unclassified Ads IBC

On the Front Cover



Single stick of chewing gum, prior to use in a chewing experiment.

On the Back Cover

Some of the controls in the control room of the German UB110 submarine. The photograph is from approximately 1918.

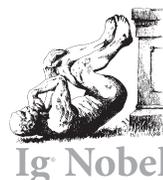


Some Coming Events

See WWW.IMPROBABLE.COM for details of these and other events:

August 12, 2014
This Is Improbable Too
– US publication day

September 18, 2014
24th First Annual Ig Nobel Prize Ceremony



September 20, 2014
Ig Informal Lectures

Late September
Book Tour (US)

October 2014
Santiago, Chile

EVERY DAY

Read something new and improbable every weekday on the Improbable Research blog, on our web site: WWW.IMPROBABLE.COM

AIR VENTS

Exhalations from our readers

NOTE: The opinions expressed here represent the opinions of the authors and do not necessarily represent the opinions of those who hold other opinions.

Versa on Vice

I disagree entirely with the theory posited in AIR 20:3 about the motives of the artist who drew the logo for the New York Society for the Suppression of Vice.

*Prof. Trevelyan Versa
Genoa, Italy*

Art Critic

I agree with the theory posited in AIR 20:3 about the motives of the artist who drew the logo for the New York Society for the Suppression of Vice. But I also believe that the theory is stupid, and that that artist was even more stupid. I don't know why you bothered to print that article. Nor do I fully understand what drove me to respond to it.

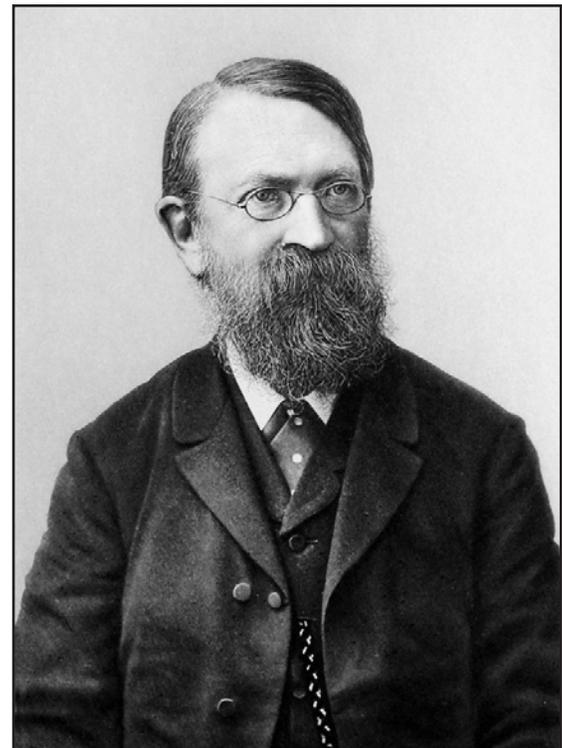
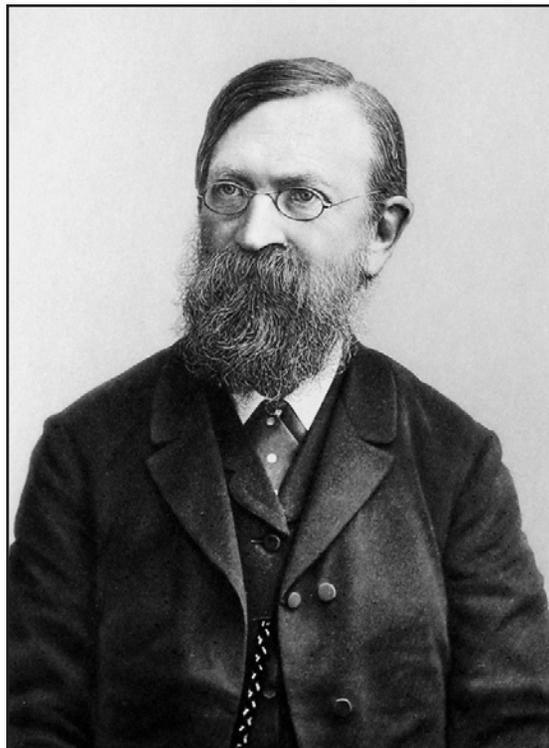
*Genevieve Lemaire
Mulhouse, France*



Mach and Not Mach

I rise to the challenge posed by Ralph Arnold Grantham in your magazine about the two photos: "One of them is of the German physicist Ernst Mach, who is dead. The other is of me. Can you spot the telltale difference?" I say to Mr. Arnold Grantham: Yes. Yes, I can.

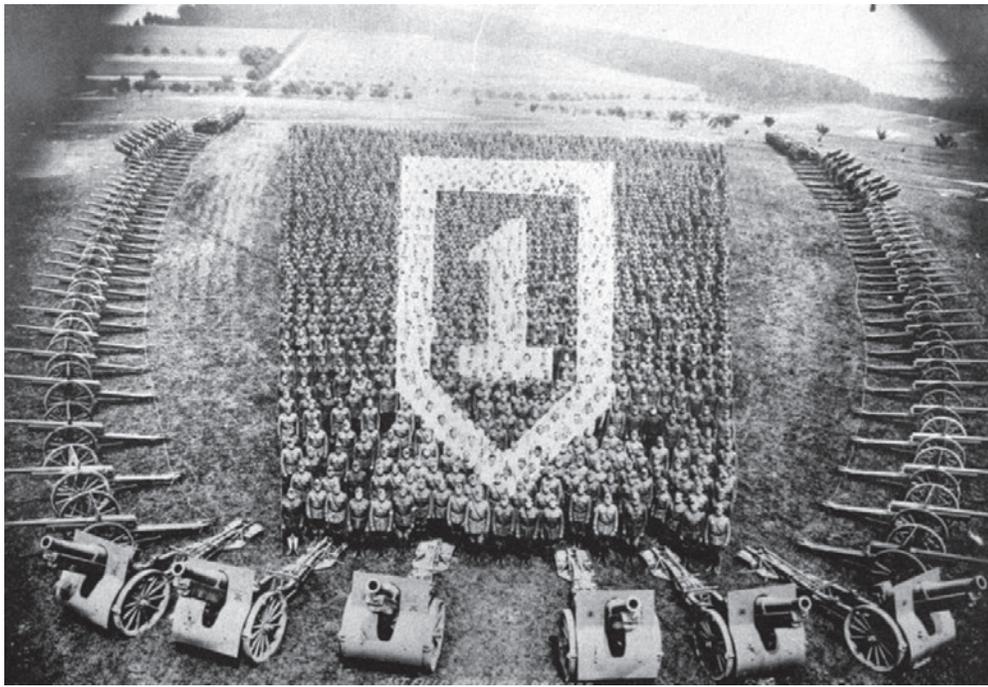
*Eunice Páez
Vilaró, MD,
Ph.D.
Paysandu,
Uruguay*



About the Doctor Who Left His Heart in San Francisco

The letter from the doctor who "left his heart in San Francisco" in AIR 20:3 was disgusting. Please print more letters from him.

*Aileen Ferrell
San Jose, California, U.S.A.*



Another Mel Photo Unearthed

Having attended your presentation at the European Open Science Forum in Copenhagen in June of this year, I was inspired through my institution's photographic archives to see if we have any photographs of Mel, the famous "little guy" who always appears in your letters column. I found one. You can plainly see Mel here in the 31st row, standing next to the man with a squint. This photograph dates from 1918, according to our records; that is the only information we have about this particular image. Perhaps your readers can supply further details.

*Gry Nielsen
Horsens, Denmark*

ANNALS OF IMPROBABLE RESEARCH EDITORIAL BOARD

Anthropology

Jonathan Marks, U. North Carolina

Archaeology

Angela E. Close, U. Washington

Astrochemistry

Scott Sandford, NASA/Ames

Astronomy

Robert Kirshner, Harvard U.
Jay M. Pasachoff, Williams Coll.
Eric Schulman, Alexandria, Virginia
David Slavsky, Loyola U., Chicago

Biology

Dany Adams, Tufts U.
Lawrence Dill*****, Simon Fraser U.

Biomaterials

Alan S. Litsky, Ohio State U.

Biophysics

Leonard X. Finegold, Drexel U.

Biotechnology

A. Stephen Dahms, Alfred E. Mann
Foundation

Bureaucracy

Miriam Bloom, SciWrite, Jackson, MS

Cardiology

Thomas Michel*****, Harvard Med. School

Chemistry

Dudley Herschbach*, Harvard U.

Computer Science

Robert T. Morris***, MIT
Margo Seltzer, Harvard U.

Economics

Ernst W. Stromsdorfer, Washington St. U.

Engineering

Dean Kamen, DEKA Research

Food Research

Massimo Marcone, U. of Guelph

Forensic Biology & Criminalistics

Mark Benecke, Int'l Forensic Res., Köln

Functional Biology & Morphology

Frank Fish, West Chester U.
Rebecca German, Johns Hopkins U.
Richard Wassersug*****, Dalhousie U.

Genetics

Michael Hengartner, U. of Zürich

Geology

John C. Holden, Omak, WA
John Spletstoesser, Waconia, MN

Immunology

Falk Fish, Organics, Ltd., Yavne, Israel

Infectious Diseases

James Michel*****, Harvard U.

Intelligence

Marilyn Vos Savant**, New York, NY

Law

William J. Maloney, New York, NY
Ronald A. May, Little Rock, AR

Library & Info Sciences

Regina Reynolds, Library of Congress
George Valas, Budapest, Hungary
Norman D. Stevens, U. of Connecticut

Marine Biology

Magnus Wahlberg*****, U. of
Southern Denmark

Materials Science

Robert M. Rose, MIT

Medical Ethics

Erwin J.O. Kompanje, Erasmus MC
University, Rotterdam

Methodology

Rod Levine, National Insts of Health

Molecular Biology

Walter Gilbert*, Harvard U.
Richard Roberts*, New England Biolabs

Molecular Pharmacology

Lloyd Fricker, Einstein Coll. of Medicine

Neurology

Thomas D. Sabin, Tufts U.

Nutrition

Brian Wansink*****, Cornell U.

Ornithology

Kees Moeliker*****, Natuurhistorisch
Museum Rotterdam

Obstetrics & Gynecology

Pek van Anel*****, Medical Faculty
Groningen, The Netherlands
Eberhard W. Lisse, Swakopmund State
Hospital, Namibia

Orthopedic Surgery

Glenn R. Johnson, Decorah, IA

Paleontology

Sally Shelton, Museum of Geology,
South Dakota School of Mines and
Technology
Earle Spamer, American Philosophical
Society, Philadelphia, PA

Parasitology

Wendy Cooper, Australian Pest &
Vet. Med. Auth.

Philosophy

George Englebretson, Bishop's U., Quebec

Physics

Len Fisher*****,
Bristol U., UK
Jerome Friedman*, MIT
Sheldon Glashow*, Boston U.
Karl Kruszelnicki*****,
U. Sydney
Harry Lipkin, Weizmann Inst.
Douglas Osheroff*, Stanford U.
Frank Wilczek*, MIT

A Guide to the Stars

- * Nobel Laureate
- ** world's highest IQ
- *** convicted felon
- **** misspelled
- ***** sibling rivalry
- ***** six stars
- ***** Ig Nobel Winner

Political Science

Richard G. Neimi****, Rochester, NY

Psychology

Dan Ariely*****, Duke U.
Louis G. Lippman, Western Wash. U.
G. Neil Martin, Regents U., UK
Chris McManus*****, University Coll.
London

Neil J. Salkind, U. of Kansas

Richard Wiseman, U of Hertfordshire

Pulmonary Medicine

Traian Mihaescu, Iasi, Romania

Research

James Harkin, QI, London, UK

Science Policy

Al Teich, American Assn for the
Advancement of Science

Stochastic Processes

(selected at random from amongst
our subscribers)
Yashpreet Juggal, London, UK

Swordswallowing

Dan Meyer *****, Cutting Edge
Innertainment

Women's Health

Andrea Dunaif, Northwestern U.
JoAnn Manson, Brigham & Women's Hosp.

IMPROBABLE RESEARCH REVIEW

Improbable theories, experiments, and conclusions

compiled by Dirk Manley, Improbable Research staff



How to Measure the Comfort of a Chimp's Nest

“Do Chimpanzees Build Comfortable Nests?”, Fiona A Stewart, Jill D. Pruetz, and Mike H. Hansell, *American Journal of Primatology*, vol. 69, no. 8, 2007, pp. 930–9. The authors, at the University of Glasgow, the University of Cambridge, and Iowa State University, explain:

Nests built by wild chimpanzees (*Pan troglodytes verus*) were studied at the Fongoli research site in southeastern Senegal.... [The] greater frequency of low nests allowed the researcher to climb into these nests without the aid of specialized equipment. This presented a unique opportunity to study chimpanzee nest construction in detail....

The researcher lay supine in four directions within the nest and scored the prevalence of uncomfortable features, to score the whole nest surface. A meter rule marked in 10 cm intervals was used to measure the size and shape of the nest, and points of discomfort were recorded on a nest map of scale 1 cm = 10 cm.

Do Chimpanzees Build Comfortable Nests?

FIONA A. STEWART^{1,2*}, JILL D. PRUETZ³, AND MIKE H. HANSELL¹
¹Division of Ecology and Evolutionary Biology, IBL, Graham Kerr Building, University of Glasgow, Glasgow, G12 8QQ, Scotland, UK
²Leverhulme Centre for Human Evolutionary Studies, Department of Biological Anthropology, The Henry Wellcome Building, University of Cambridge, Fitzwilliam Street, Cambridge, CB2 1QH, UK
³Department of Anthropology, Iowa State University, 324 Curtiss, Ames, Iowa

Nests built by wild chimpanzees (*Pan troglodytes verus*) were studied at the Fongoli research site in southeastern Senegal from January 2004–May 2004 to investigate the role of comfort in nest building behavior by relating measures of nest comfort and building effort. Nest comfort across zones of the nest surface were compared with construction effort for 25 nests. Several variables of nest comfort were assessed: (1) physical discomfort, (2) visible discomfort, and (3) softness. Physical discomfort was used as a representative measure of nest discomfort.

They Do Not Gratefully Thank

“Rotational Splittings with CoRoT, Expected Number of Detections and Measurement Accuracy,” M.J. Goupil, J. Lochard, R. Samadi, C. Barban, Marc-Antoine Dupret, and A. Baglin, *ESA Special Publication*, vol. 1306, 2006, p. 453. The authors, at Laboratoire d’Etudes Spatiales et d’Instrumentation pour l’Astrophysique, Observatoire de Paris, Meudon, France, end their paper with this brief section:

We gratefully thank the Programme National de Physique Stellaire for financial support. We do not gratefully thank T. Appourchaux for his useless and very mean comments.

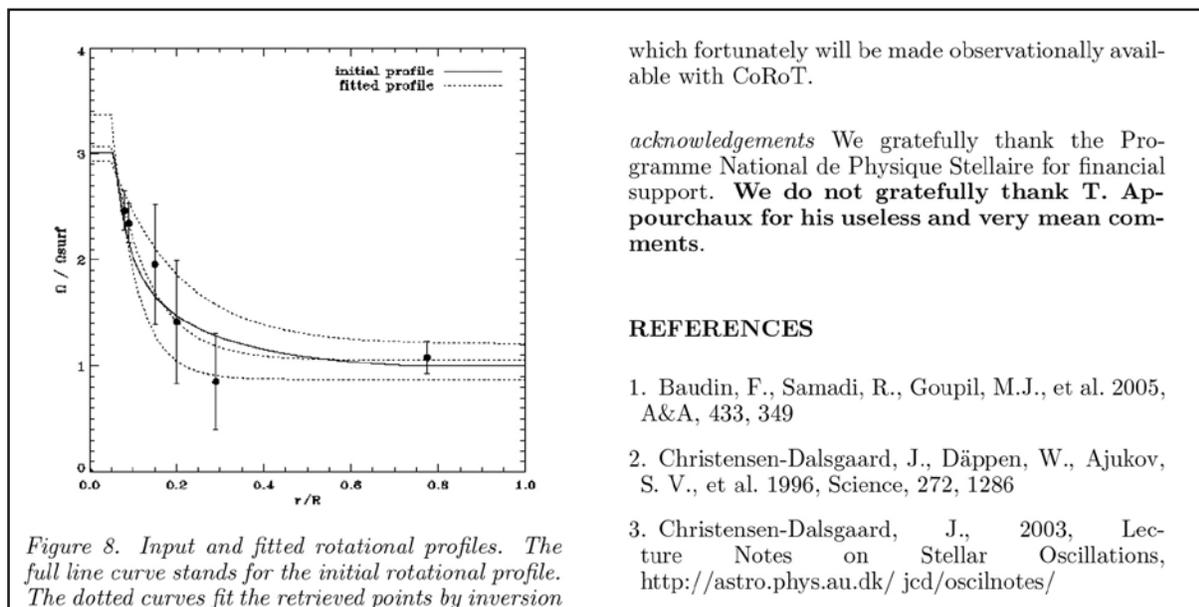


Figure 8. Input and fitted rotational profiles. The full line curve stands for the initial rotational profile. The dotted curves fit the retrieved points by inversion

which fortunately will be made observationally available with CoRoT.

acknowledgements We gratefully thank the Programme National de Physique Stellaire for financial support. **We do not gratefully thank T. Appourchaux for his useless and very mean comments.**

REFERENCES

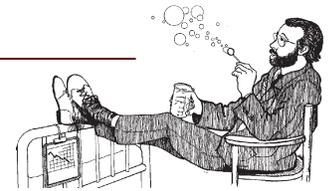
1. Baudin, F., Samadi, R., Goupil, M.J., et al. 2005, *A&A*, 433, 349
2. Christensen-Dalsgaard, J., Däppen, W., Ajukov, S. V., et al. 1996, *Science*, 272, 1286
3. Christensen-Dalsgaard, J., 2003, *Lecture Notes on Stellar Oscillations*, <http://astro.phys.au.dk/jcd/oscilnotes/>

Detail—including the mention of T. Appourchaux—from the study “Rotational Splittings with CoRoT, Expected Number of Detections and Measurement Accuracy.”

IMPROBABLE MEDICAL REVIEW

Improbable diagnoses, techniques, and research

compiled by Bertha Vanatian, Improbable Research staff



He Chewed Gum, He Died

“Adult Sudden Death Caused by Aspiration of Chewing Gum,” S.N. Njau, *Forensic Science International*, vol. 139, nos. 2-3, January 28, 2004, pp. 103-6. (Thanks to Kristine Danowski for bringing this to our attention.) The author, who is at Aristotle University of Thessaloniki, Greece, reports that:

A 24-year-old white male died suddenly. A piece of chewing gum lodged in a pool of frothy fluid was revealed at autopsy.

Analysis of Chewed Chewing Gum

“Identification from a Bitemark in a Wad of Chewing Gum,” P. Nambiar, G. Carson, Jane Amelia Taylor, and Kenneth Aylesbury Brown, *Journal of Forensic Odonto-Stomatology*, vol. 19, no. 1, 2001, p. 5.

A Wad of Gum

“Quantitative Evaluation of the Effect of Bolus Size and Number of Chewing Strokes on the Intra-Oral Mixing of a Two-Colour Chewing Gum,” J.F. Prinz, *Journal of Oral Rehabilitation*, vol. 26, no. 3, March 1999, pp. 243–7. The authors, at the University of Hong Kong, report:

In this test chewing gum containing two contrasting colours is chewed. On removal from the mouth the bolus is placed in a transparent plastic bag, flattened and a digital image is taken. Several image processing techniques are described and evaluated as measures of the amount of mixing present in the chewed gum. Flattening the gum was found to increase the accuracy of subjective evaluation.

Adult sudden death caused by aspiration of chewing gum

S.N. Njau

Department of Forensic Medicine and Toxicology, Aristotle University of Thessaloniki, Thessaloniki 54124 Greece

Received 21 November 2001; accepted 16 September 2003

We welcome your suggestions for this and other columns. Please enclose the full citation (no abbreviations!) and, if possible, a copy of the paper.

J. F. PRINZ

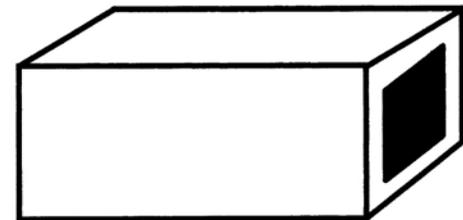


Fig. 1. Bubble-Yum™ lime flavour gum was used as the test food, portions a full, half and a quarter of a piece were chewed by the subjects.

Detail from the study “Quantitative Evaluation of the Effect of Bolus Size and Number of Chewing Strokes on the Intra-Oral Mixing of a Two-Colour Chewing Gum.”

Table 1. Means and standard deviations (s.d.) of image processing measurements after 10 chewing strokes on three portion sizes of lime flavour Bubble Yum™ gum and correlation of each measure with the number of chewing strokes

Image processing measurement	Bolus size			ANOVA significance of size	Correlation with number of chewing strokes
	Full	Half	Quarter		
Low contrast	1386.40 (383.89)	942.87 (290.99)	1105.77 (259.48)	$P < 0.05$	0.50 $P < 0.001$
High contrast	662.00 (25.01)	592.12 (48.70)	630.15 (36.07)	$P < 0.05$	-0.20 $P < 0.05$
Polarity	1.35 (0.13)	1.27 (0.03)	1.37 (0.12)	n.s.	-0.13 n.s.
Fragmentation	120.66 (17.55)	109.66 (20.13)	109.00 (22.16)	n.s.	-0.24 $P < 0.05$
Blending	0.18 (0.09)	0.21 (0.07)	0.22 (0.07)	n.s.	0.07 n.s.
Spatial frequency	35.91 (11.28)	29.44 (5.45)	30.94 (10.37)	n.s.	0.14 $P < 0.05$
Nearest neighbour analysis	7.33 (1.03)	7.77 (1.20)	7.85 (1.46)	n.s.	0.21 $P < 0.05$

Further detail from the study “Quantitative Evaluation of the Effect of Bolus Size and Number of Chewing Strokes on the Intra-Oral Mixing of a Two-Colour Chewing Gum.”



Harry Hollingworth. Sketch by Nan Swift, *Improbable Research* staff.

PSYCHO-DYNAMICS OF CHEWING

A quick look at Hollingsworth's looks at certain effects of chewing

compiled by Katherine Lee, *Improbable Research* staff

Harry L. Hollingworth wrote the book that can be considered the bible of psychological research about people who chew chewing gum. Called *Psycho-Dynamics of Chewing*, it was published in 1939 as an entire issue of the scholarly journal *Archives of Psychology*.

(Thanks to Jean Berko Gleason for assistance in chewing on this matter.)

The research was sponsored by the Beech-Nut company, makers of chewing gum. The publisher explained:

This book offers a series of experiments that study the psychodynamics of chewing in various contexts. Chewing is such a satisfying activity, in itself, that random masticatories such as straws, toothpicks, rubber bands, are utilized in order to support it.... The familiarity and convenience of the confectioned masticatory provides a useful technique for the experimental variation of such a motor automatism as chewing. Its widespread use in daily life makes it a conspicuous social institution, or at least a custom, and it is a problem of some scientific interest to inquire into the intrinsic factors which presumably perpetuate and extend such a conventionalized practise. With all these interests in mind we have instituted an extended series of experimental investigations on the role of sustained mastication in the psycho-physical economy of human activity.

Metabolism Costs of Chewing

"Metabolism Costs of Chewing," Harry L. Hollingworth, *Archives of Psychology*, vol. 239, 1939, pp. 14–26. Hollingworth explains:

Unless the main occupation is so sedentary as to permit of little or no restless movement, the activity of sustained chewing may be supported with no net energy costs to the organism.... Of course sustained mastication uses energy; the best evidence shows that it costs some .20 calories per minute as an energy equivalent. But in active occupation this cost is not added to the total energy requirements of the active organism. Although the facts are not revealed in the metabolism experiment here reported, data from other parts of our more extended investigation of the psycho-dynamics of chewing show that energy which would otherwise be expended in the form of restless and random movement supports the

mastication and may even provide a surplus which may be directed into the activities of the main occupation....

Our subjects were two male graduate students of psychology, with previous experience as metabolism subjects. Metabolism rate was measured by the respiration technique, using the helmet devised by Benedict. The helmet, like an inverted aluminum pail, was suspended from the ceiling by a system of weights and pulleys so that it would permit adjustment to the individual subject and permit him to wear the helmet comfortably enough so as to be able to undertake a routine task. The helmet having been sealed in an air-tight fashion about the subject's head, outside air was supplied for breathing and the expired air was moved out of the helmet by a fan and collected in a Douglas bag for examination.

Writing While Chewing

"Writing Pressure as Modified by Chewing," Harry L. Hollingworth, *Archives of Psychology*, vol. 239, 1939, pp. 51–6. Hollingworth explains:

Pencil-and-paper activities were set up,—these being the familiar laboratory exercises,—Substitution, Cancellation, and Mental Addition. All of these called for the writing of numbers or marks on the test sheet. In addition, on one such blank the subject was required to write his signature (including the date and the number of the series).

In each case the test blanks had been made up in the form of a pad which concealed, between corresponding white sheets, five sheets of black carbon paper (Guild 1049 Pencil Carbon). The greater the writing pressure, the deeper down into this carbon-pad would the impression go. "With 5 such carbons it is fairly easy to make out degrees of such impression....

Four workers were studied, working four half-day periods, with 8 rounds of work in each period.... On two of the half-days the workers were under normal conditions throughout (no chewing). On two half-days they were instructed to chew continuously during the comparison trials (last four rounds) the masticatory being peppermint flavored confectioner's chicle....

In the forenoon comparisons two subjects exert greater pressure while chewing; two exert less. In the afternoons there is complete agreement; all four subjects exert more pressure while chewing.

Typing While Chewing

“Speed and Accuracy of Typing While Chewing,” Harry L. Hollingworth, *Archives of Psychology*, vol. 239, 1939, pp. 67-71. Hollingworth explains:

[W]e have experimentally studied the work of two proficient typists. They worked in the laboratory, following the same work schedule as another group of subjects who were being measured in other kinds of work, during 11 half day periods....

But on Chewing days there is in both subjects a very considerable relaxation reported. Fol’s strain estimates drop 10 points below Normal and 42 points below Control record. Prn’s estimates drop to only about half the Normal rating and to 85 points below the rating on Control periods.

Both subjects, in other words, report themselves as having experienced a feeling of marked relaxation while chewing, even Pol who does not enjoy this activity. This relaxation is reported by the two subjects while they are nevertheless typing at a more rapid rate, and in the case of Prn at least, with greater accuracy. Perhaps it is also significant that the reduction of subjectively felt strain, while chewing, is the greater in the case of that subject who admits a fondness for the sustained use of a masticatory.

Working While Chewing

“Influence of Chewing on Output in Routine Work,” Harry L. Hollingworth, *Archives of Psychology*, vol. 239, 1939, pp. 72-87. Hollingworth explains:

All in all we have studied nine different kinds of work and in them have found no evidence that sustained chewing (which reportedly requires a metabolism increment of some 17 percent and consumes 5 or more calories per hour of the worker’s energy) exerts any important effect on work output in routine tasks. Most of the activities show just no measurable change attributable to sustained mastication.

Averaging the results for days of each kind and reducing the data to calories per minute as in previous tables, we get the following:

	Chewing	Normal	Control
Brn90	.68	.80
Gld28	.06	.52

Detail from the study “Metabolism Costs of Chewing.”

Subj.	Saturday—Normal			Sunday—Chewing			Difference	
	First 4	Last 4	Ratio	First 4	Last 4	Ratio		
Forenoons								
Flo	4.0	4.0	100	5.5	7.5	137	37	
Joh	7.5	7.0	93	6.5	5.5	84	- 9	
Mar	8.5	9.0	106	9.0	8.0	89	-17	
Vir	14.5	13.5	93	14.0	15.5	110	17	
							Average	7
Afternoons								
Flo	7.5	7.5	100	5.5	6.5	117	17	
Joh	7.5	6.5	87	6.5	7.0	107	20	
Mar	10.0	9.0	90	8.5	8.0	95	5	
Vir	17.5	16.0	91	13.5	15.0	111	20	
							Average	15.5

Detail from the study “Writing Pressure as Modified by Chewing.”

Subj.	N N Ch Ch					N N C C		N N N N			
	P.M.	P.M.	A.M.	P.M.	A.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Fol	95	58	133	123	164	116	109	96	106	120	96
Average-Chewing 115%					Control 113%		Normal 105%				
Prn	104	77	126	88	106	77	124	143	143	100	139
Average-Chewing 100%					Control 101%		Normal 131%				

The figures for error are even more erratic than those for time. Nevertheless the averages, however unreliable statistically, tell the story correctly as examination of the separate scores will show. Subject Fol makes more errors (relatively) while Chewing and with Mint Control than on Normal days. Three of her five error scores on Chewing days are larger than any of the scores on Control or Normal days. And her scores on Control days are larger than all but one of the scores on Normal days. On the whole, her gain of 2 or 3 percent in time on Chewing and Control days appears to have been at the cost of 8 to 10 percent increase in errors.

In the case of Prn the results are very different. Although her gain in time when Chewing was about 10 percent over the Control and Normal performance, she made this gain along with a decrease in error score. On 3 of the 4 Normal periods she made more errors than on any of the 5 Chewing days. She made, however, relatively

Detail from the study “Speed and Accuracy of Typing While Chewing.”

Subject	Medians: Percent Comparison Period Is of Base			Superiority of Chewing to Mint	Superiority of Chewing to Normal
	Chewing	Mint	Normal		
Joh	95	96	94	- 1	1
Rob	99	105	94	- 6	5
Ala	98	98	98	0	0
Vir	98	115	105	-17	- 7
Mar	108	95	103	13	5
Flo	116	102	101	14	15
Averages	102.3	101.8	99.2	0.5	3.1

in favor of Chewing, amounting to about 2 percent. The least that can be said is that there is no evidence in these records that Chewing in any way interferes with output in Mental Addition.

Detail from the study “Influence of Chewing on Output in Routine Work.”

SOME TENTATIVE COGNITIVE EFFECTS OF CHEWING GUM

Highlights from gummy, chewy research literature about cognition

compiled by Katherine Lee, Improbable Research staff

Numerous researchers, doing numerous studies, have debated and are debating whether there are cognitive effects of chewing chewing gum, and if there are such effects, what, how strong, and how consistent those effects may be.

Cognitive Advantages of Chewing Gum

“Cognitive Advantages of Chewing Gum: Now You See Them, Now You Don’t,” Serge V. Onyper, Timothy L. Carr, John S. Farrar, and Brittney R. Floyd, *Appetite*, vol. 57, no. 2, October 2011, pp. 321–8. The authors, at St. Lawrence University, Canton, New York, explain:

The current series of experiments investigated the effects of the timing of gum chewing on cognitive function, by administering a battery of cognitive tasks to participants who chewed gum either prior to or throughout testing, and comparing their performance to that of controls who did not chew gum. Chewing gum was associated with performance advantages on multiple measures when gum was chewed for 5 min before, but not during, cognitive testing. The benefits, however, persisted only for the first 15–20 min of the testing session, and did not extend to all cognitive domains. This... can potentially account for a wide range of findings reported in the literature.

Cognitive advantages of chewing gum. Now you see them, now you don’t

Serge V. Onyper*, Timothy L. Carr, John S. Farrar, Brittney R. Floyd

Department of Psychology, St. Lawrence University, Canton, NY 13617, USA

<p>ARTICLE INFO</p> <hr/> <p><small>Article history:</small> Received 2 March 2011 Received in revised form 25 April 2011 Accepted 19 May 2011 Available online 27 May 2011</p> <hr/> <p><small>Keywords:</small> Chewing gum Time Cognition</p>	<p>ABSTRACT</p> <hr/> <p>The current series of experiments investigated the effects of the timing of gum chewing on cognitive function, by administering a battery of cognitive tasks to participants who chewed gum either prior to or throughout testing, and comparing their performance to that of controls who did not chew gum. Chewing gum was associated with performance advantages on multiple measures when gum was chewed for 5 min before, but not during, cognitive testing. The benefits, however, persisted only for the first 15–20 min of the testing session, and did not extend to all cognitive domains. To explain this pattern of results, it is proposed that the time-limited nature of performance benefits can be attributed to mastication-induced arousal. Furthermore, the lack of improvement in cognitive function when gum is chewed throughout testing may be because of interference effects due to a sharing of resources by cognitive and masticatory processes. This dual process mechanism is not only consistent with the</p>
---	--

Chewing Gum and Memory (2004): Yup

“Chewing Gum Can Produce Context-Dependent Effects Upon Memory,” Jess R. Baker, Jessica B. Bezance, Ella Zellaby, and John P. Aggleton, *Appetite*, vol. 43, 2004, pp. 207–10. The authors, at Cardiff University, Wales, U.K., report:

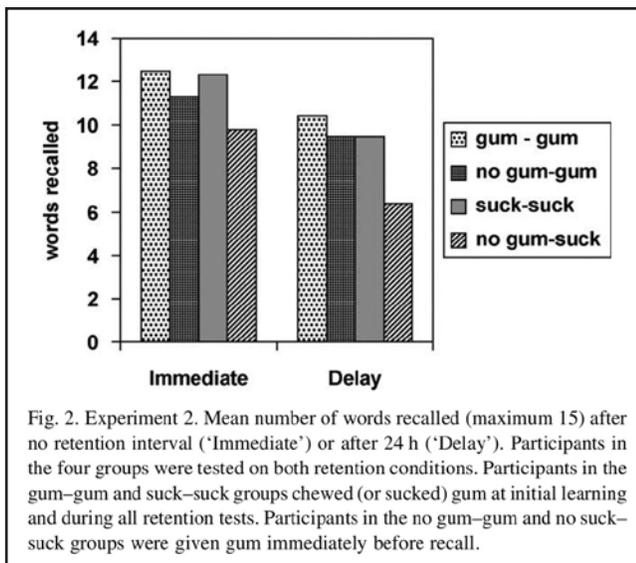
Two experiments examined whether chewing spearmint gum can affect the initial learning or subsequent recall of a word list. Comparing those participants in Experiment 1 who chewed gum at the learning or the recall phases showed that chewing gum at initial learning was associated with superior recall. In addition, chewing gum led to context-dependent effects as a switch between gum and no gum (or no gum and gum) between learning and recall led to poorer performance. Experiment 2

provided evidence that sucking gum was sufficient to induce some of the same effects as chewing.

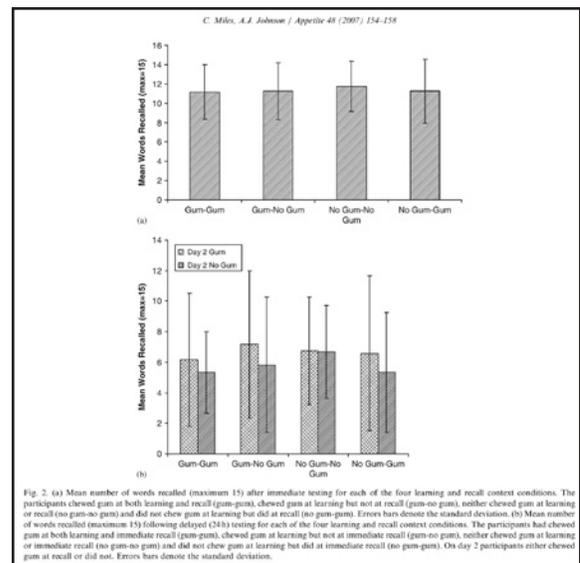
Chewing Gum and Memory (2007): Nope

“Chewing Gum and Context-Dependent Memory Effects: A Re-Examination,” Christopher Miles and Andrew J. Johnson, *Appetite*, vol. 48, no. 2, March 2007, pp. 1548. (*Thanks to Martin Gardiner for bringing this to our attention.*) The authors, also at Cardiff University, report:

Two experiments re-examined whether chewing spearmint gum affects initial word learning and/or immediate recall for a word list. Both experiments failed to show effects of chewing gum at learning or recall, nor did they suggest that chewing gum produces a context-dependent memory effect.



Detail from the study "Chewing Gum and Context-Dependent Memory Effects: A Re-Examination."



Detail from the study "Chewing Gum and Context-Dependent Memory Effects: A Re-Examination."

Chewing Gum versus Depression

"Chewing Gum May Be an Effective Complementary Therapy in Patients with Mild to Moderate Depression," Furkan Muhammed Erbay, Nazan Aydın, and Tülay Satı-Kırkan, *Appetite*, vol. 65, June 2013, pp. 31–4. The authors, at Ataturk University, Erzurum, Turkey, explain:

30 patients with mild to moderate depression were given either medication combined with chewing gum, or medication only, for 6 weeks.... Those patients who were administrated chewing gum responded better to the treatment than patients who took medication only. The most beneficial effect of chewing gum was observed on the gastrointestinal symptoms, e.g. loss of appetite, and flatulence among others. These results indicate that chewing gum may not be directly effective on depressed mood; however, it may reduce the symptoms originating from depression.

Chewing gum may be an effective complementary therapy in patients with mild to moderate depression

Furkan Muhammed Erbay^{a,*}, Nazan Aydın^b, Tülay Satı-Kırkan^b

^aSchool of Medicine, Ataturk University, Yakutiye 25240, Erzurum, Turkey

^bDepartment of Psychiatry, School of Medicine, Ataturk University, Yakutiye 25240, Erzurum, Turkey

ARTICLE INFO

Article history:

Received 21 July 2012

Received in revised form 26 January 2013

Accepted 3 February 2013

Available online 12 February 2013

Keywords:

Chewing gum

Depression

Stress

ABSTRACT

Previous studies indicated that chewing gum may relieve stress and depression. There have, however, not been a significant number of studies on clinical usage of chewing gum. In the present study, 30 patients with mild to moderate depression were given either medication combined with chewing gum, or medication only, for 6 weeks. Turkish adaptation of Hamilton Rating Scale for Depression (HAM-D) was used to measure depression levels. Assessments were conducted by the same physician both before, and after treatment. The physician who was responsible for the assessment was not aware of the group allocation. Changes in main HAM-D scores and each item were analyzed by independent samples *t* test and Chi-Square test, respectively. Those patients who were administrated chewing gum responded better to the treatment than patients who took medication only. The most beneficial effect of chewing gum was observed on the gastrointestinal symptoms, e.g. loss of appetite, and flatulence among others. These

Detail from the study "Chewing Gum May Be an Effective Complementary Therapy in Patients with Mild to Moderate Depression."

continued >

SOME TENTATIVE COGNITIVE EFFECTS OF CHEWING GUM [CONTINUED]

Cognitive Disadvantages of Chewing Gum, and Chewing's Relation to Tapping

“Gummed-up Memory: Chewing Gum Impairs Short-Term Recall,” Michail D. Kozlov, Robert W. Hughes, and Dylan M. Jones, *Quarterly Journal of Experimental Psychology*, vol. 65, no. 3, March 2012, pp. 501–13. (Thanks to Scott Langill for bringing this to our attention.) The authors, coincidentally at Cardiff University, explain:

Several studies have suggested that short-term memory is generally improved by chewing gum. However, we report the first studies to show that chewing gum impairs short-term memory.... Experiment 1 showed that chewing gum reduces serial recall of letter lists. Experiment 2 indicated that chewing does not simply disrupt vocal-articulatory planning required for order retention: Chewing equally impairs a matched task that required retention of list item identity. Experiment 3 demonstrated that manual tapping produces a similar pattern of impairment to that of chewing gum.

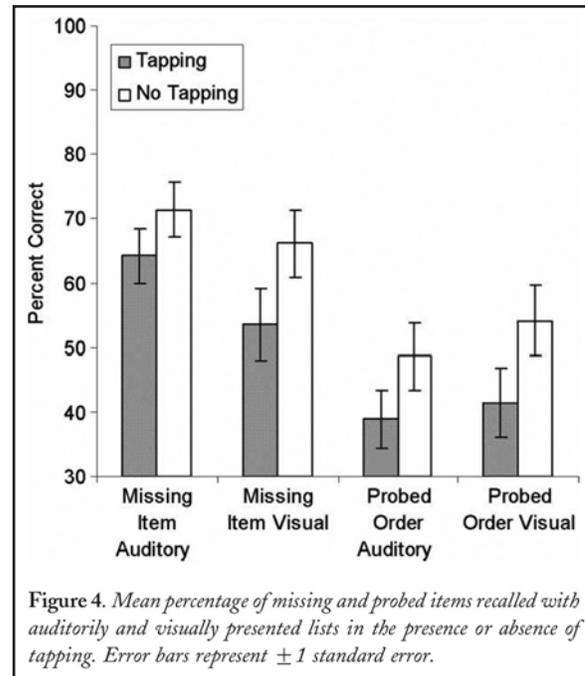


Figure 4. Mean percentage of missing and probed items recalled with auditorily and visually presented lists in the presence or absence of tapping. Error bars represent ± 1 standard error.

Detail from the study “Gummed-up Memory: Chewing Gum Impairs Short-Term Recall.”



Andrew Scholey, gum-chewing/cognition researcher. Sketch by Nan Swift, *Improbable Research* staff.

Scholey the Gum-chewing Effects Gumshoe

Andrew Scholey, at the University of Northumbria, Newcastle upon Tyne, U.K., and later at Swinburne University of Technology in Hawthorn, Victoria, Australia, has done a lengthy series of experiments involving chewing gum and the mind. Other scholars have, in some cases, found some of these studies to be provocative.

Scholey on Gum (2002)

“Chewing Gum Selectively Improves Aspects of Memory in Healthy Volunteers,” Lucy Wilkinson, Andrew Scholey, and Keith Wesnes, *Appetite*, vol. 38, 2002, pp. 235–6.

These results provided the first evidence that the chewing of gum can improve episodic memory (involving the learning, storage and retrieval of information) and working memory (where information is held “on line”).

Table 1. Cognitive effects of chewing

Measure	Chew	Sham	Quiet
Simple RT	0.27	0.30^a	0.27
Dig Vig Acc	96	94	97
Dig Vig RT	0.41	0.43	0.41
CRT Acc	94	92	93
CRT	0.43	0.43	0.43
SPM SI	0.89^a	0.80	0.81
SPM RT	0.71	0.71	0.75
NWM SI	0.84	0.85	0.84
NWM RT	0.68^a	0.66^a	0.79
Imm Recall	8.6^b	5.2	6.9
Del Recall	7.1^b	4.3	5.2
Word Rec SI	0.64	0.52	0.65
Word Rec RT	0.73	0.77	0.77
Pic Rec SI	0.69	0.59	0.66
Pic Rec RT	0.85	0.90	0.87

Mean scores of the chewing (‘chew’), sham chewing (‘sham’) and ‘quiet’ controls, for CDR measures grouped according to whether they assess attention (top), working memory (middle) or long-term memory (bottom). SRT and CRT: simple and choice reaction time (s); Dig Vig: Digit Vigilance; SPM and NWM: spatial and numeric working memory; Imm Recall and Del Recall refer to immediate and delayed word recall; Word Rec and Pic Rec: Word and Picture recognition respectively. SI=sensitivity index for tasks with a recognition component, ranging from +1 to -1; Acc=percent accuracy. Bold numerals indicate significant differences from quiet control (a), $p < 0.05$; (b), $p < 0.01$.

Detail from the 2002 Scholey study “Chewing Gum Selectively Improves Aspects of Memory in Healthy Volunteers.”

Chewing gum and cognitive performance: a case of a functional food with function but no food?

Andrew Scholey

Human Cognitive Neuroscience Unit, Division of Psychology, Northumbria University, Newcastle upon Tyne NE1 8ST, UK

Received 10 June 2004; revised 15 July 2004; accepted 26 July 2004

Abstract

Recent reports suggest that enhancement of memory performance while chewing gum is a fairly robust phenomenon. The processes underlying the effect are not known, but may involve glucose delivery, context-dependent effects and arousal mechanisms amongst others. This brief commentary outlines the main findings from these studies and raises some issues regarding interpretation, methodology and future research directions.

Detail from the study "Chewing Gum and Cognitive Performance: A Case of a Functional Food with Function But No Food?"

Scholey on Gum (2004)

"Chewing Gum and Cognitive Performance: A Case of a Functional Food with Function but No Food?", Andrew Scholey, *Appetite*, vol. 43, no. 2, October 2004, pp. 215–6.

Recent reports suggest that enhancement of memory performance while chewing gum is a fairly robust phenomenon. The processes underlying the effect are not known, but may involve glucose delivery, context-dependent effects and arousal mechanisms amongst others. This brief commentary outlines the main findings from these studies and raises some issues regarding interpretation, methodology and future research directions.

Stephens on Gum

"Role of Glucose in Chewing Gum-Related Facilitation of Cognitive Function," Richard Stephens and Richard J. Tunney, *Appetite*, vol. 43, no. 2, Oct. 2004, pp. 211–3. Richard Stephens is an Ig Nobel Prize winner, having been awarded the 2010 Ig Nobel peace prize for his study "Swearing as a Response to Pain" (Richard Stephens, John Atkins, and Andrew Kingston, *Neuroreport*, vol. 20, no. 12, 2009, pp. 1056–60). In this gum study Stephens and co-author Tunney write:

This study tests the hypothesis that chewing gum leads to cognitive benefits through improved delivery of glucose to the brain, by comparing the cognitive performance effects of gum [chewing a single strip of Wrigley's sugarfree mint flavoured gum] and glucose administered separately and together.

How does chewing gum affect cognitive function? Reply to Scholey (2004)

Richard Stephens^{a,*}, Richard J. Tunney^b

^a*School of Psychology, Keele University, Staffordshire ST5 5BG, UK*
^b*School of Psychology, University of Nottingham, UK*

Received 10 June 2004; revised 15 July 2004; accepted 26 July 2004

Abstract

Cognitive effects of glucose from chewing gum and other mechanisms can be investigated further when factors like the flavouring of the gum and the participants' familiarity with gum chewing are assessed.
© 2004 Elsevier Ltd. All rights reserved.

Keywords: Cognition; Chewing gum; Glucose; Mint flavouring; Product familiarity

Detail from the study "How Does Chewing Gum Affect Cognitive Function? Reply to Scholey (2004)."

Stephens on Scholey on Gum

"How Does Chewing Gum Affect Cognitive Function? Reply to Scholey (2004)," Richard Stephens and Richard J. Tunney, *Appetite*, vol. 43, no. 2, October 2004, pp. 217–8. Stephens and Tunney write:

we discuss here how the studies reviewed by Scholey conform to our hypothesis that chewing gum affects some aspects of cognition by means of enhanced glucose delivery via the act of chewing. At first blush the data reported by Tucha *et al.* (2004) and Baker *et al.* (2004) seem inconsistent with this hypothesis. However, Tucha *et al.* found null effects with respect to both gum-related improvement in cognition and changes in heart rate. This is consistent with our hypothesis that heart rate must increase for chewing gum to enhance cognition.

continued >

SOME TENTATIVE COGNITIVE EFFECTS OF CHEWING GUM [CONTINUED]

A. Scholey et al. / *Physiology & Behavior* 97 (2009) 304–312

Table 1
Effect of chewing gum on mood and cortisol during low and medium intensity settings of the multi-tasking platform.

		Low intensity			Medium intensity		
		Pre-platform	Post-platform	Cohen's d^a	Pre-platform	Post-platform	Cohen's d^a
Alert ^c (mm)	Not chewing	54.07 ± 2.28	50.33 ± 2.74	0.40	58.01 ± 2.03	53.13 ± 2.29	0.36
	Chewing	57.37 ± 2.21	59.73 ± 2.44		57.49 ± 2.29	57.39 ± 2.09	
Content (mm)	Not chewing	62.23 ± 1.95	61.55 ± 2.20	0.10	65.60 ± 2.19	63.36 ± 2.14	0.28
	Chewing	66.33 ± 2.05	64.48 ± 1.91		64.89 ± 2.04	66.00 ± 2.08	
Calm (mm)	Not chewing	58.61 ± 2.33	57.43 ± 2.29	0.16	59.11 ± 2.38	55.25 ± 2.45	0.09
	Chewing	63.41 ± 2.30	58.90 ± 2.57		60.33 ± 2.04	54.99 ± 2.38	
Stress ^c (mm)	Not chewing	26.24 ± 2.60	34.51 ± 3.37	0.20	28.04 ± 2.81	38.65 ± 3.38	0.39
	Chewing	25.03 ± 2.53	30.03 ± 3.38		27.99 ± 2.97	33.50 ± 3.43	
STAI-S ^c (score)	Not chewing	34.58 ± 1.25	36.65 ± 1.23	0.28	34.80 ± 1.33	37.28 ± 1.25	0.28
	Chewing	33.48 ± 1.19	33.90 ± 1.23		34.58 ± 1.31	35.63 ± 1.36	
Cortisol ^c (nM)	Not chewing	5.44 ± 0.64	5.52 ± 0.61	0.81	6.10 ± 0.64	6.13 ± 0.61	0.17
	Chewing	5.71 ± 0.61	4.64 ± 0.61		6.60 ± 0.80	5.41 ± 0.61	

Mean values (± SEM) before ('pre-') and after ('post') the platform are presented for each outcome under conditions of chewing and not chewing gum. ^c = significant main effect of chewing.

^aEffect sizes (Cohen's d) are shown for change-from-baseline Δ scores (as plotted in Fig. 3).

Detail from the study "Chewing Gum Alleviates Negative Mood and Reduces Cortisol During Acute Laboratory Psychological Stress."

Scholey on Stephens on Scholey on Gum

"Further Issues Regarding the Possible Modulation of Cognitive Function by the Chewing of gum: Response to Stephens and Tunney (2004) and Tucha *et al.* (2004)," Andrew Scholey, *Appetite*, vol. 43, 2004, pp. 221–3. Scholey writes:

An initial summary of four papers in *Appetite* on modulation of cognitive function while chewing gum attempted to identify the bearing of similarities and differences between methodologies on the results reported. In their responses the authors of two of the papers highlight further methodological and theoretical issues, and these are discussed briefly here.

Scholey on Gum (2009)

"Chewing Gum Alleviates Negative Mood and Reduces Cortisol During Acute Laboratory Psychological Stress," Andrew Scholey, Crystal Haskell, Bernadette Robertson, David Kennedy, Anthea Milne, Mark Wetherell, *Physiology and Behavior*, June 22, 2009, vol. 97, nos. 3–4, pp. 304–312. (Thanks to Ig Nobel Prize winner Richard Wassersug for bringing this to our attention.) Scholey and his colleagues write:

to what extent can sugar-free gum be classed as a nutraceutical? The latter is strictly defined as any substance that is a food or a part of a food which provides medical or health benefits. The term is used more loosely to describe so-called 'functional foods' whose administration provides something other than simple nutritional load. Clearly sugar-free gum has no nutritional value as such, ironically making it theoretically more similar to a pharmaceutical than a nutraceutical, despite apparently sharing more elements with feeding than with drug ingestion.



CHEWING GUM AND YOUTHS

Selected highlights from the literature about chewing gum and youths

compiled by Katherine Lee, Improbable Research staff

Young persons are, in popular legend, the main consumers of chewing gum. By some accounts youths are its main beneficiaries, and by some accounts its main victims. Various researchers have examined questions raised in and by these legends and accounts.

Gum Chewing in School: Boosts Concentration

“Chewing Gum and Concentration Performance,” U. Tänzer, A. von Fintel, and T. Eikermann, *Psychological Reports*, vol. 105, no. 2, October 2009, pp. 372–4. The authors, at University of Oldenburg, Therapy Centre Hamburg-Fuhlsbüttel, Germany, report:

The effect of chewing gum on performance was examined. Four Grade 3 (8- to 9-year-olds) classes in a German primary school participated; 2 classes chewed gum during a 16-min. concentration test.

The experiment was run in simple fashion:

In two randomly chosen classes, Wrigley’s Extra Fruity sugar-free gum was chewed during the test; in the other two classes it was not.... A modified version of the Differentieller Leistungstest–Konzentration Grundschule was administered to test the concentration of elementary schoolchildren. Children were asked to work through sheets of

TABLE 1
AVERAGE NUMBER OF SYMBOLS COMPLETED PER TIME PERIOD

	Time Period, 2 min.							
	1*	2	3	4	5	6	7	8
No. of Elements								
With Gum		127.6	131.3	134.3	138.8	140.1	158.4	156.7
Dotted or Crossed		133.0	138.6	145.3	147.6	148.8	139.0	138.5
Without Gum								

*Due to a misunderstanding in two classes caused by pupils carrying on using a page of symbols meant to be used only for a brief practice, the results of the first period could not be accurately determined and had to be discounted.

Detail from the study “Chewing Gum and Concentration Performance.”

paper containing 400 individual elements. Each element was one of over 20 symbols. Three of the symbols were to be crossed out with a single line when they appeared, and all the other symbols marked with a dot. Every 2 min., children were asked to start a fresh sheet of elements, eight sheets in total.

The experiment, say the researchers, yielded a simple result:

Chewing gum had a significant and positive effect on concentration performance.

Gum Chewing in School: Improves Math Scores

“The Effects of Gum Chewing on Math Scores in Adolescents.” Clinical trial registered with ClinicalTrials.gov, study no. NCT00792116, Baylor College of Medicine, first received October 24, 2008. The clinical trial was later cited in this press release by the Wrigley Company, which makes chewing gum.

continued >

WRIGLEY

PRESS RELEASE

New Study Shows Chewing Gum Can Lead to Better Academic Performance in Teenagers

Higher math scores seen in classroom setting

WHAT: New research from Baylor College of Medicine indicates a positive effect of chewing gum on academic performance in teenagers. The study examined whether chewing Wrigley sugar-free gum can lead to better academic performance in a “real life” classroom setting. Major findings include:

- The researchers found that students who chewed gum showed an **increase in standardized math test scores and their final grades were better compared** to those who didn’t chew gum.
 - Students who chewed gum had a significantly greater increase in their standardized math test scores after 14 weeks of chewing gum in math class and while doing homework compared to those who did not chew gum. Chewing gum was associated with a three percent increase in standardized math test scores, a small but statistically significant change.
 - Students who chewed gum had final grades that were significantly better than those who didn’t chew gum.

Today’s competitive testing environment has parents and students looking for approaches to improve academic performance, particularly as standardized test scores have become a mandatory requirement for assessing academic achievement. Together, these findings can be meaningful when related to small steps that can lead to better academic

CHEWING GUM AND YOUTHS [CONTINUED]

A.P. Smith, M. Woods / *Appetite* 58 (2012) 1037–1040

Table 1

Effects of chewing gum on stress, work done and mental health (high scores = greater stress, not getting enough work done, and more mental health problems. Scores are the adjusted means, s.e.s in parentheses).

	No gum (N = 35)	<40 pieces of gum (N = 20)	>40 pieces of gum (N = 17)
Stress	15.87 (0.38)	15.66 (0.50)	14.42 (0.55)
Not getting enough work done	3.76 (0.15)	3.11 (0.20)	3.19 (0.22)
Anxiety	6.84 (0.16)	6.88 (0.22)	6.55 (0.24)
Depression	8.64 (0.17)	8.03 (0.22)	8.79 (0.24)
Tiredness	3.67 (0.23)	3.53 (0.31)	3.47 (0.33)

Detail from the study “Effects of Chewing Gum on the Stress and Work of University Students.”

Chewing Gum, 72 Youths, and Stress

“Effects of Chewing Gum on the Stress and Work of University Students,” Andrew P. Smith and Martin Woods, *Appetite*, vol. 58, no. 3, June 2012, pp. 1037–40. The authors, at Cardiff University, Wales, U.K., explain:

72 students completed 2 weeks of either chewing gum or refraining from chewing gum. They completed scales measuring perceived stress, anxiety, depression, and single item measures of work levels and tiredness. These were completed both pre- and post-treatment. Perceived stress decreased as a function of the amount of gum chewed. The chewing gum condition was also associated with a decrease in not getting enough academic work done. There were no significant effects of chewing gum on mental health outcomes.

The research covered a range of gums:

Participants were allowed free choice from a variety of flavours from the Wrigley’s sugar-free range to encourage and maintain chewing (Airwaves menthol and eucalyptus, Airwaves black mint, Airwaves cherry menthol, Extra cool breeze, Extra spearmint, Extra peppermint, Extra Ice, Orbit complete peppermint, Orbit complete spearmint).

The numerical aspect of the research used a simple procedure to transform the raw data into a form that is more traditional in the world of biomedicine:

Participants in the chewing gum group recorded how many sticks of chewing gum they consumed each day, which was later analysed for a dose response.

Chewing Gum, 30 Youths, and Headaches

“The Influence of Excessive Chewing Gum Use on Headache Frequency and Severity Among Adolescents,” Nathan Waternberg, Manar Matar, Miki Har-Gil, and Muhammad Mahajnah, *Pediatric Neurology*, vol. 50, no. 1, January 2014, pp. 69–72. (Thanks to Falk Fish for bringing this to our attention.) The authors, at Tel Aviv University and Technion University, Israel, report:

we hypothesized that excessive gum chewing may act as a trigger for temporomandibular joint-related headache.... In summary, in our population of 30 older children and adolescents with chronic headaches and excessive gum-chewing, discontinuation of the habit led to headache resolution in 19 patients and to partial improvement in seven patients. Moreover, restitution of the gum-chewing habit in 20 of the 30 patients was followed by reappearance of the usual headaches in all. The association between excessive daily gum-chewing and headaches in older children and adolescents is underreported in the medical literature.... Interestingly, popular reports and articles do associate gum-chewing with headaches.

day. By classifying our patients into four subgroups according to gum-chewing duration, we attempted to determine whether a minimum habit duration was necessary to provoke the headaches.

- Group 1: Up to 1 hour of gum-chewing a day.
- Group 2: 1-3 hours of gum-chewing/day.
- Group 3: 3-6 hours of gum-chewing/day.
- Group 4: More than 6 hours/day.

Detail from the study “The Influence of Excessive Chewing Gum Use on Headache Frequency and Severity Among Adolescents.”

CHEWING GUM RESEARCH REVIEW

Selected highlights from research involving chewing chewing gum or, in one case, not chewing chewing gum

compiled by Katherine Lee, Improbable Research staff

The Effect of Chewing on Chewing

“The Effect of Masseter Activity Patterns during Chewing on Suprahyoid Activity in Subsequent Chewing Cycles,” Yozo Miyaoka, Ichiro Ashida, Hajime Iwamori, Shin-ya Kawakami, Takako Yamazaki, and Naoko Ito, *Journal of Behavioral and Brain Science*, vol. 4 no. 2, 2014, pp. 69–74. The authors, at Niigata University of Health and Welfare, Niigata, Japan, report:

Few studies have evaluated the effects of activity patterns of the jaw closing muscles assessed by specific parameters on jaw opening in subsequent cycles during the chewing of food. The objective of this study was to quantitatively analyze the effect of the masseter (jaw closer) activity patterns on suprahyoid (jaw opener) activity during subsequent cycles.... [Our] results suggest that masseter activity patterns partially affect suprahyoid activity during subsequent chewing cycles and that the effect is food dependent.

Bubble Gum Enema

“Gone but Not Forgotten: Bubble Gum Enema Containing Hydrogen Peroxide and Causing Life-Threatening Colitis,” Rizwan Kibria, Syed A. Ali, and Christopher J. Barde, *Gastrointestinal Endoscopy*, vol. 72, no. 3, 2010, pp. 619–21. The authors, at Wright State University, Dayton, Ohio, report:

A 61-year-old man was seen in consultation for rectal bleeding. He had constipation that was unresponsive to Milk of Magnesia and docusate sodium and was given a “bubble gum” enema containing 90 mL each of hydrogen peroxide, sodium phosphate, and docusate sodium to relieve his constipation....

Bubble gum was invented in 1928 by Walter E. Diemer, who only recommended it be chewed. Swallowed bubble gum has been

reported to cause bezoar formation and refractory constipation, while allowing the health care worker the privilege of “taffy-pull” disimpactions. As for the name “bubble gum enema,” I guess the reaction of H_2O_2 with catalase reminded these authors of the happy days of their childhood, but even such pleasant reveries should not counter current recommendations to keep H_2O_2 far from the rectum.

Effects of gum chewing on recovery of bowel function following cesarean section: a randomized controlled trial

Bordin Jakkaw · Kittipat Charoenkwan

Received: 4 February 2012 / Accepted: 17 January 2013 / Published online: 17 February 2013
© Springer-Verlag Berlin Heidelberg 2013

Abstract

Purpose To evaluate the effects of gum chewing on recovery of bowel function after cesarean section.

Methods Fifty pregnant women who underwent cesarean section at Chiang Mai University hospital from September 2010 to December 2010 were recruited. After cesarean

Conclusion Gum chewing is associated with faster recovery of bowel function following cesarean section. It is safe, practical, inexpensive, and well tolerated.

Keywords Bowel function · Cesarean section · Cesarean delivery · Gum chewing · Paralytic ileus

Effects of Gum Chewing on Recovery of Bowel Function

“Effects of Gum Chewing on Recovery of Bowel Function Following Cesarean Section: A Randomized Controlled Trial,” Bordin Jakkaw and Kittipat Charoenkwan, *Archives of Gynecology and Obstetrics*, vol. 288, no. 2, August 2013, pp. 55–260. The authors, at Chiang Mai University, Thailand, report:

Conclusion: Gum chewing is associated with faster recovery of bowel function following cesarean section. It is safe, practical, inexpensive, and well tolerated.

Gone but not forgotten. “Bubble gum enema” containing hydrogen peroxide and causing life-threatening colitis

A 61-year-old man was seen in consultation for rectal bleeding. He had constipation that was unresponsive to Milk of Magnesia (Bayer Health Care, Morristown, NJ) and docusate sodium and was given a “bubble gum” enema containing 90 mL each of hydrogen peroxide, sodium phosphate, and docusate sodium to relieve his constipation. One hour later, he developed severe abdominal pain and passed bloody bowel movements. Abdominal exam

rectosigmoid wall thickening and inflammatory changes (A,B). He was treated with parenteral fluids, levofloxacin, and metronidazole. Colonoscopy revealed friable mucosa with discrete ulcerations covered with yellowish-green pseudomembranes up to 40 centimeters from the anus; more proximally, the appearance of the mucosa improved but it still was erythematous (C,D). Biopsy specimens showed focal acute ulcerations with congestion of lamina

IMPROBABLE SEX

Improbable, stimulating investigations

compiled by Marc Abrahams, *Improbable Research staff*

Menstruation and Composers of Complex Music

“Menstrual Cycle Phase Alters Women’s Sexual Preferences for Composers of More Complex Music,” Benjamin D. Charlton, *Proceedings of the Royal Society B*, epub April 23, 2014. (Thanks to Hugh Henry for bringing this to our attention.) The author, at the University of Brighton, U.K., explains:

Over 140 years ago Charles Darwin first argued that birdsong and human music, having no clear survival benefit, were obvious candidates for sexual selection. Whereas the first contention is now universally accepted, his theory that music is a product of sexual selection through mate choice has largely been neglected. Here, I provide the first, to my knowledge, empirical support for the sexual selection hypothesis of music evolution by showing that women have sexual preferences during peak conception times for men that are able to create more complex music. Two-alternative forced-choice experiments revealed that woman only preferred composers of more complex music as short-term sexual partners when conception risk was highest.... These results suggest that women may acquire genetic benefits for offspring by selecting musicians able to create more complex music as sexual partners.

Dr. Windmill on the Singing Penis

“So Small, So Loud: Extremely High Sound Pressure Level from a Pygmy Aquatic Insect (*Corixidae*, *Micronectinae*),” Jerome Sueur, David Mackie, and James F. C. Windmill,

Menstrual cycle phase alters women’s sexual preferences for composers of more complex music

Benjamin D. Charlton

School of Psychology, University of Sussex, Brighton, BN1 9QH, UK

Over 140 years ago Charles Darwin first argued that birdsong and human music, having no clear survival benefit, were obvious candidates for sexual selection. Whereas the first contention is now universally accepted, his theory that music is a product of sexual selection through mate choice has largely been neglected. Here, I provide the first, to my knowledge, empirical support for the sexual selection hypothesis of music evolution by showing that women have sexual preferences during peak conception times for men that are able to create more complex music. Two-alternative forced-choice

PLoS ONE, vol. 6, no. 6, June 15, 2011, e21089. (Thanks to Len Finegold for bringing this to our attention.) The authors, at Museum National d’Histoire Naturelle, Paris, France, and the University of Strathclyde, Glasgow, Scotland, U.K., report:

Here we analyse for the first time the calling song produced by the male of a small insect, the water boatman *Micronecta scholtzi*.... This energy output is significant considering the small size of the insect. When scaled to body length and compared to 227 other acoustic species, the acoustic energy produced by *M. scholtzi* appears as an extreme value, outperforming marine and terrestrial mammal vocalisations.... The sound is produced by rubbing a pars stridens on the right paramere (genitalia appendage) against a ridge on the left lobe of the eighth abdominal segment.

So Small, So Loud: Extremely High Sound Pressure Level from a Pygmy Aquatic Insect (*Corixidae*, *Micronectinae*)

Jérôme Sueur^{1*}, David Mackie², James F. C. Windmill²

¹ Muséum national d’Histoire naturelle, Département Systématique et Evolution, UMR 7205 CNRS Origine Structure et Evolution de la Biodiversité, Paris, France, ² Department of Electronic and Electrical Engineering, Centre for Ultrasonic Engineering, University of Strathclyde, Glasgow, United Kingdom

Abstract

To communicate at long range, animals have to produce intense but intelligible signals. This task might be difficult to achieve due to mechanical constraints, in particular relating to body size. Whilst the acoustic behaviour of large marine and terrestrial animals has been thoroughly studied, very little is known about the sound produced by small arthropods living in freshwater habitats. Here we analyse for the first time the calling song produced by the male of a small insect, the water

Detail from the study “So Small, So Loud: Extremely High Sound Pressure Level from a Pygmy Aquatic Insect (*Corixidae*, *Micronectinae*).”

SOFT IS HARD

Further evidence why the “soft” sciences are the hardest to do well

compiled by Alice Shirrell Kaswell and Bissell Mango, Improbable Research staff

The Future as Reliably Determined by What Kids Say Immediately After They Play with an Object for Five Minutes

“Boys Can Be Anything’: Effect of Barbie Play on Girls’ Career Cognitions,” Aurora M. Sherman and Eileen L. Zurbriggen, vol. 70, nos. 5–6, March 2014, pp. 195–208.

We investigated perceptions of careers girls felt they could do in the future as compared to the number of careers they felt boys could do as a function of condition (playing with a Barbie or Mrs. Potato Head doll) and type of career (male dominated or female dominated) in a sample of 37 U.S. girls aged 4–7 years old residing in the Pacific Northwest. After a randomly assigned 5-min exposure to condition, children were asked how many of ten different occupations they themselves could do in the future and how many of those occupations a boy could do.... girls reported that boys could do significantly more occupations than they could themselves, especially when considering male-dominated careers. In addition, girls’ ideas about careers for themselves compared to careers for boys interacted with condition, such that girls who played with Barbie indicated that they had fewer future career options than boys, whereas girls who played with Mrs. Potato Head reported a smaller difference between future possible careers for themselves as compared to boys.

Detail from the study “Boys Can Be Anything’: Effect of Barbie Play on Girls’ Career Cognitions.”

Hair Loss and Electability

“Hair Loss and Electability: The Bald Truth,” Lee Sigelman, Edwin Dawson, Michael Nitz, and Marcia Lynn Whicker, *Journal of Nonverbal Behavior*,

vol. 14, no. 4, December 1990, pp. 269–83. The authors, at the University of Arizona, report:

This study [investigates] the extent to which and the mechanisms through which bald and balding men are underrepresented in high elective office. Study 1 compares the prevalence of hair loss among governors and members of Congress, on the one hand, and the general public, on the other, and concludes that officeholders are much more likely to have a full head of hair than would be expected of men of their age. Study 2 poses an experimental test of voter bias against bald and balding candidates by presenting voters in a simulated congressional race with materials depicting otherwise identical candidates in either their natural bald or balding condition or wearing a professionally fitted hairpiece. No voter bias against bald or balding candidates is apparent, a finding that suggests that the causal mechanism underlying underrepresentation of bald and balding men is not voter bias.

HAIR LOSS AND ELECTABILITY: THE BALD TRUTH

Lee Sigelman
Edwin Dawson
Michael Nitz
Marcia Lynn Whicker

ABSTRACT: This study probes one particular component of the well documented linkage between personal appearance and impression formation by investigating the extent to which and the mechanisms through which bald and balding men are underrepresented in high elective office. Study 1 compares the prevalence of hair loss among governors and members of Congress, on the one hand, and the general public, on the other, and concludes that officeholders are much more likely to have a full head of hair than would be expected of men of their age. Study 2 poses

Fig. 1 Fashion Barbie, Doctor Barbie, Jane Potato Head as they were presented to participants



PLUCKED FROM OBSCURITY: INDUCE SLEEP BY RESTRICTING BLOOD SUPPLY TO ONE'S HEAD

Inventive, yet under-publicized devices

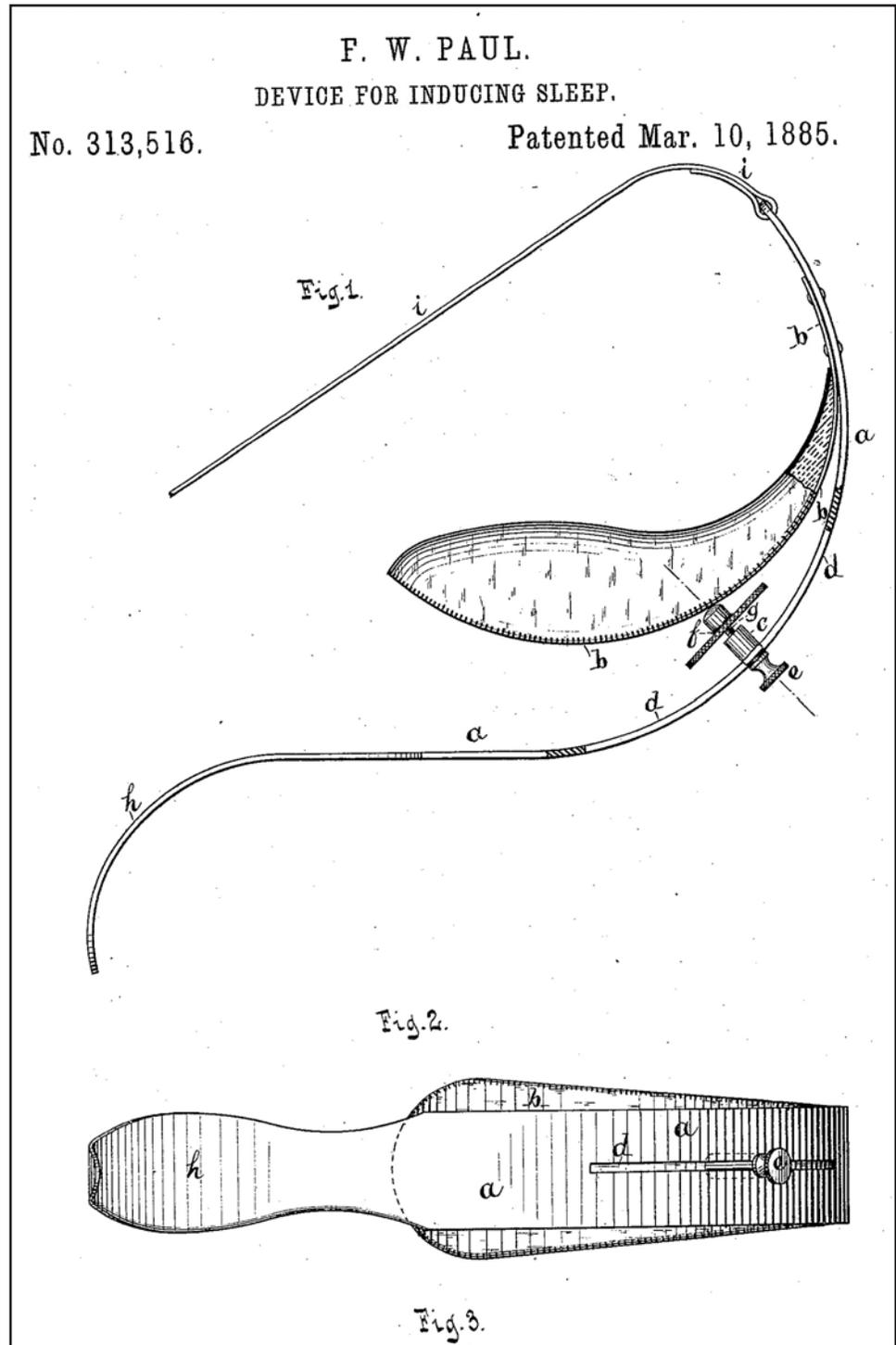
by Marina Tshipis, Improbable Research staff

“Device for Inducing Sleep,” U.S. patent 313516, granted March 10, 1885 to Fanny W. Paul. (Thanks to James Harkin for bringing this to our attention.) The document explains:

The object of this instrument is to slightly modify this flow of blood to the head, and thereby reduce the activity of the brain in order that sleep may ensue.

I have experimented with different degrees of pressure upon the arteries and veins of the neck, and find that while pressure applied without proper limit and adjustment only excites the sufferer additionally, by the use of this instrument the proper pressure is obtained to control the undesirable flow of blood above referred to, and very soon after this takes place the nervous system becomes soothed and quieted, and sleep follows almost immediately, and sleep thus obtained refreshes and builds up the system and the nervous organization, there being no after effects, as in the use of narcotics or opiates....

[The device is] composed of a collar-like band provided with an adjustable and padded spring, and a strap or equivalent device for retaining the band in position.



Detail from the patent.

ICKY CUTESY RESEARCH REVIEW

Research reports that are icky and/or cutesy

compiled by Alice Shirrell Kaswell, *Improbable Research staff*

Icky: Bobcats' Carcass-Chewing

"Scavenging Behavior of *Lynx rufus* on Human Remains During the Winter Months of Southeast Texas," Angela Rippley, Nicole C. Larison, Kathryn E. Moss, Jeffrey D. Kelly, and Joan A. Bytheway, *Journal of Forensic Sciences*, vol. 57, no. 3, May 2012, pp. 699–705. The authors, at Sam Houston State University and the University of Houston, Texas, report:

Animal-scavenging alterations on human remains can be mistaken as human criminal activity. A 32-day study, documenting animal scavenging on a human cadaver, was conducted at the Southeast Texas Applied Forensic Science facility, Sam Houston State University, Huntsville, Texas. [A motion-activated camera] was positioned near the cadaver to capture scavenging activity.... Results show that the bobcat did not feed on areas of the body that it does for other large animal carcasses.

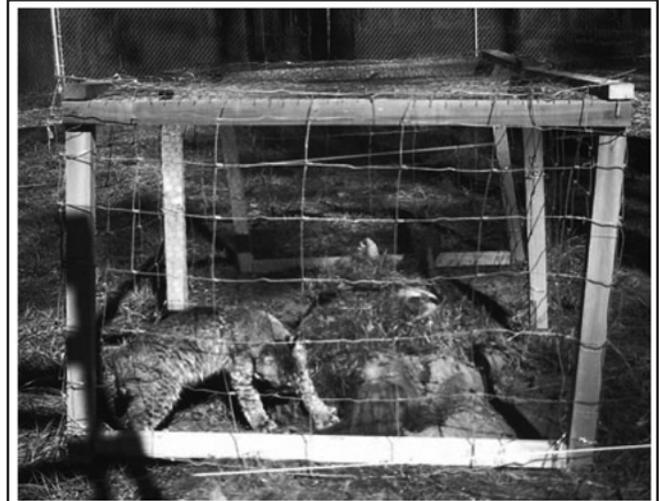


FIG. 1—*Lynx rufus*, the bobcat, is covering the body with soil, pine needles, grass, and the cadaver's own hair. Covering its food source is a typical behavior of the bobcat.

Cutesy: Count the Js

"How Do I Love Thee? Let Me Count the Js: Implicit Egotism and Interpersonal Attraction," John T. Jones, Brett W. Pelham, Mauricio Carvalho, and Matthew C. Mirenberg, *Journal of Personality and Social Psychology*, vol. 87, no. 5, 2004, pp. 665–83. The authors, at the United States Military Academy, State University of New York at Buffalo, and Columbia University, explain:

From the perspective of implicit egotism people should gravitate toward others who resemble them because similar others activate people's positive, automatic associations about themselves. Four archival studies and 3 experiments supported this hypothesis.... Participants were more attracted than usual to people (a) whose arbitrary experimental code numbers resembled their own birthday numbers, (b) whose surnames shared letters with their own surnames, and (c) whose jersey number had been paired, subliminally, with their own names.

How Do I Love Thee? Let Me Count the Js: Implicit Egotism and Interpersonal Attraction

John T. Jones
United States Military Academy

Brett W. Pelham and Mauricio Carvalho
State University of New York at Buffalo

Matthew C. Mirenberg
Columbia University

From the perspective of implicit egotism people should gravitate toward others who resemble them because similar others activate people's positive, automatic associations about themselves. Four archival studies and 3 experiments supported this hypothesis. Studies 1–4 showed that people are disproportionately likely to marry others whose first or last names resemble their own. Studies 5–7 provided experimental support for implicit egotism. Participants were more attracted than usual to people (a)

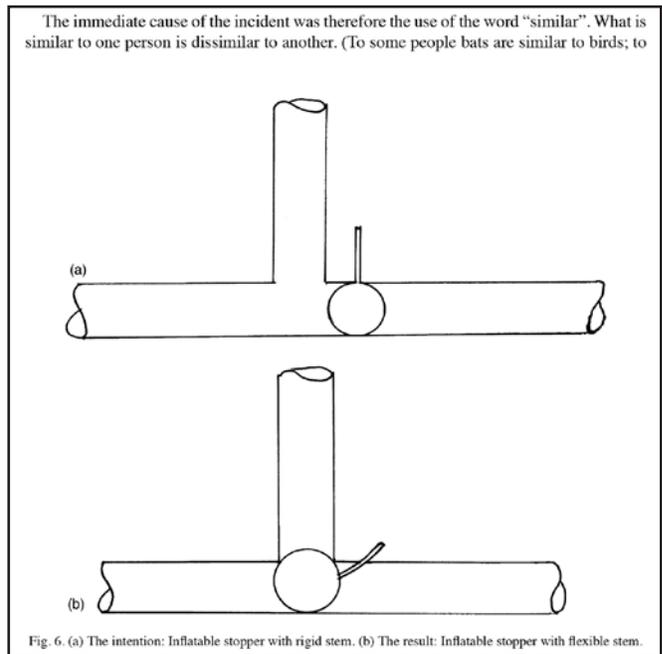
MAY WE RECOMMEND: EQUIPMENT THAT CANNOT DO WHAT WE WANT IT TO DO

Items that merit an extra look

compiled by Stephen Drew, Improbable Research staff

“Equipment That Cannot Do What We Want It to Do,” Trevor Kletz, *Journal of Hazardous Materials*, vol. 104, nos. 1–3, 2003, pp. 95–105. (Thanks to Tom Gill for bringing this to our attention.) The author, at Loughborough University, U.K., laments that:

Able, well-meaning people are sometimes surprised to find that the equipment or instrumented system they have designed is unable to do what they want it to do, either because it defies the laws of science or has other unforeseen faults. Some examples are described.



Detail from the study.

Equipment that cannot do what we want it to do[☆]

Trevor Kletz

Department of Chemical Engineering, Loughborough University,
Loughborough LE11 3TU, UK

Abstract

Able, well-meaning people are sometimes surprised to find that the equipment or instrumented system they have designed is unable to do what they want it to do, either because it defies the laws of science or has other unforeseen faults. Some examples are described.

The new Improbable book!

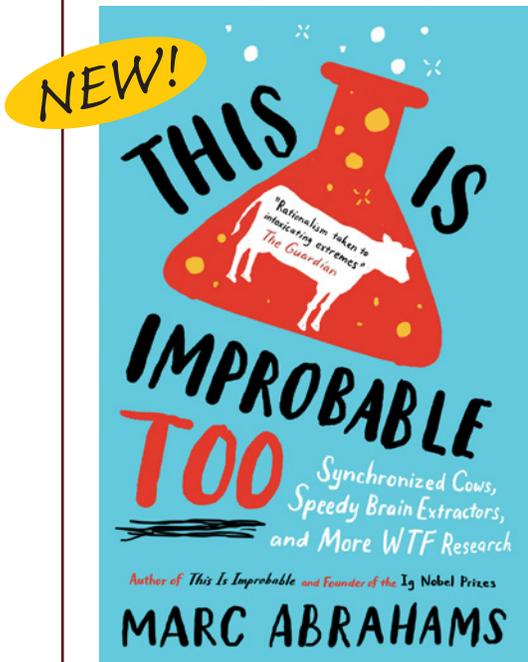
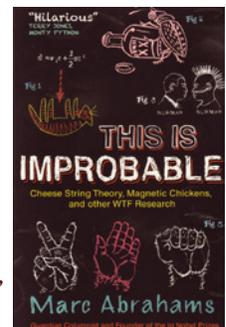
This Is Improbable Too, by Marc Abrahams,
OneWorld Publications, 2014, ISBN 978-1780743615.
(Published in March in the UK, in August in the US)

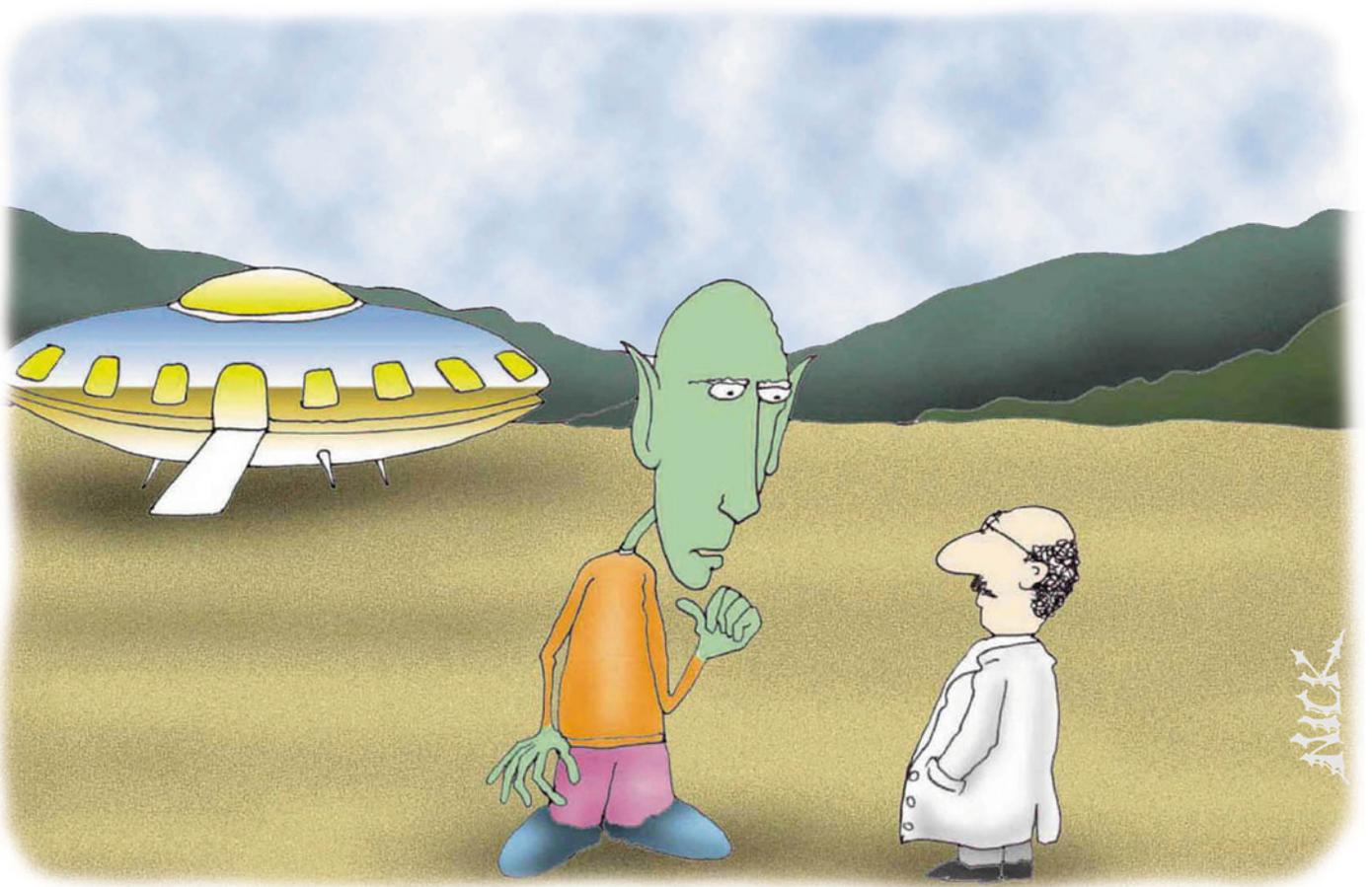
“It’s almost dementedly inconsequential”
—The Daily Mail

The almost-new Improbable book!

This Is Improbable,
by Marc Abrahams,
OneWorld Publications, 2012,
ISBN 978-1851689316.

“Rationalism taken to intoxicating extremes”
—The Guardian





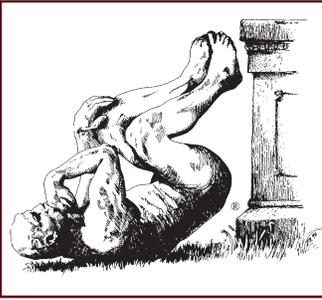
"That? No, that isn't a U.F.O. It's on the ground now, and you've identified it. That makes it an I.G.O."

AIR Teachers' Guide

Three out of five teachers agree: curiosity is a dangerous thing, especially in students. If you are one of the other two teachers, *AIR* and *mini-AIR* can be powerful tools. Choose your favorite *hAIR*-raising article and give copies to your students. The approach is simple. The scientist thinks that he (or she, or whatever), of all people, has discovered something about how the universe behaves. So:

- Is this scientist right—and what does “right” mean, anyway?
- Can you think of even one different explanation that works as well or better?
- Did the test really, really, truly, unquestionably, completely test what the author thought he was testing?
- Is the scientist ruthlessly honest with himself about how well his idea explains everything, or could he be suffering from wishful thinking?
- Some people might say this is foolish. Should you take their word for it?
- Other people might say this is absolutely correct and important. Should you take their word for it?

Kids are naturally good scientists. Help them stay that way.



IG® & BEYOND: BEES, FISH, MUSIC AND WHISKEY

Some further research adventures of Ig Nobel Prize winners

compiled by Nan Swift, Improbable Research staff

Dacke and Baird: Collision Detection in Bees versus Fish

“Control of Self-Motion in Dynamic Fluids: Fish Do It Differently From Bees,” Christine Scholtyssek, Marie Dacke, Ronald Kröger, and Emily Baird, *Biology Letters*, vol. 10, no. 5, 2014, 20140279. (Thanks to Tony Tweedale for bringing this to our attention.) Marie Dacke and Emily Baird, and other colleagues, shared the 2013 Ig Nobel Prize awarded jointly in the fields of biology and astronomy, for discovering that when dung beetles get lost, they can navigate their way home by looking at the Milky Way. [REFERENCE: “Dung Beetles Use the Milky Way for Orientation,” Marie Dacke, Emily Baird, Marcus Byrne, Clarke H. Scholtz, and Eric J. Warrant, *Current Biology*, vol. 23, no. 4, February 18, 2013, pp. 298–300.] In this fish/birds paper, Dacke and Baird and two other colleagues at Lund University, Sweden, report:

To detect and avoid collisions, animals need to perceive and control the distance and the speed with which they are moving relative to obstacles. This is especially challenging for swimming and flying animals... Flying animals primarily rely on optic flow to control flight speed and distance to obstacles. Here, we investigate whether swimming animals use similar strategies for self-motion control to flying animals by directly comparing

the trajectories of zebrafish (*Danio rerio*) and bumblebees (*Bombus terrestris*) moving through the same experimental tunnel. While moving through the tunnel, black and white patterns produced (i) strong horizontal optic flow cues on both walls, (ii) weak horizontal optic flow cues on both walls and (iii) strong optic flow cues on one wall and weak optic flow cues on the other. We find that the mean speed of zebrafish does not depend on the amount of optic flow perceived from the walls. We further show that zebrafish, unlike bumblebees, move closer to the wall that provides the strongest visual feedback.

Watanabe: Fishes’ Take on Musical Composers

“Reinforcing and Discriminative Stimulus Properties of Music in Goldfish,” Kazutaka Shinozuka, Haruka Ono, and Shigeru Watanabe, *Behavioural Processes*, vol. 99, October 2013, pp. 26–33. (Thanks to Scott Langill for bringing this to our attention.) Shigeru Watanabe shared the 1995 Ig Nobel Prize for psychology, for success in training pigeons to discriminate between the paintings of Picasso and those of Monet. [REFERENCE: “Pigeons’ Discrimination of Paintings by Monet and Picasso,” Shigeru Watanabe, Junko Sakamoto, and Masumi Wakita, *Journal of the Experimental Analysis of Behavior*, vol. 63, 1995, pp. 165–174.] In this new study, Watanabe and two other colleagues at Keio University explain:

Experiment 1 examined the discriminative stimulus properties of music. The subjects were successfully trained to discriminate between two pieces of music—*Tocatta and Fugue in D minor* (BWV 565) by J. S. Bach and *The Rite of Spring* by I. Stravinsky. Experiment 2 examined the reinforcing properties of sounds, including BWV 565 and *The Rite of Spring*. We developed an apparatus for measuring spontaneous sound preference in goldfish. Music or noise stimuli were presented depending on the subject’s position in the aquarium, and the time spent in each area was measured. The results indicated that the goldfish did not show consistent preferences for music.

Control of self-motion in dynamic fluids: fish do it differently from bees

Christine Scholtyssek, Marie Dacke, Ronald Kröger and Emily Baird

Vision Group, Department of Biology, Lund University, 22362 Lund, Sweden

To detect and avoid collisions, animals need to perceive and control the distance and the speed with which they are moving relative to obstacles. This is especially challenging for swimming and flying animals that must control movement in a dynamic fluid without reference from physical contact to the ground. Flying animals primarily rely on optic flow to control flight speed and distance to obstacles. Here, we investigate whether swimming animals use similar strategies for self-motion control to flying animals by directly comparing the trajectories of zebrafish (*Danio rerio*) and bumblebees (*Bombus terrestris*) moving through the same experimental tunnel. While

Spence: Whisky in a Room

“Assessing the Influence of the Multisensory Environment on the Whisky Drinking Experience,” Carlos Velasco, Russell Jones, Scott King, and Charles Spence, *Flavour*, vol. 2, no. 1, 2013, pp. 1–11.

Charles Spence shared the 2008 Ig Nobel Prize for nutrition for electronically modifying the sound of a potato chip to make the person chewing the chip believe it to be crisper and fresher than it really is. [REFERENCE: “The Role of Auditory Cues in Modulating the Perceived Crispness and Staleness of Potato Chips,” Massimiliano Zampini and Charles Spence, *Journal of Sensory Studies*, vol. 19, October 2004, pp. 347–63.] In this new study, Spence and colleagues at Oxford University and Condiment Junkie, London, U.K., explain:

participants were exposed to three different multisensory atmospheres/rooms, and rated various attributes of the whisky (specifically the nose, the taste/flavor, and the aftertaste) in each room.

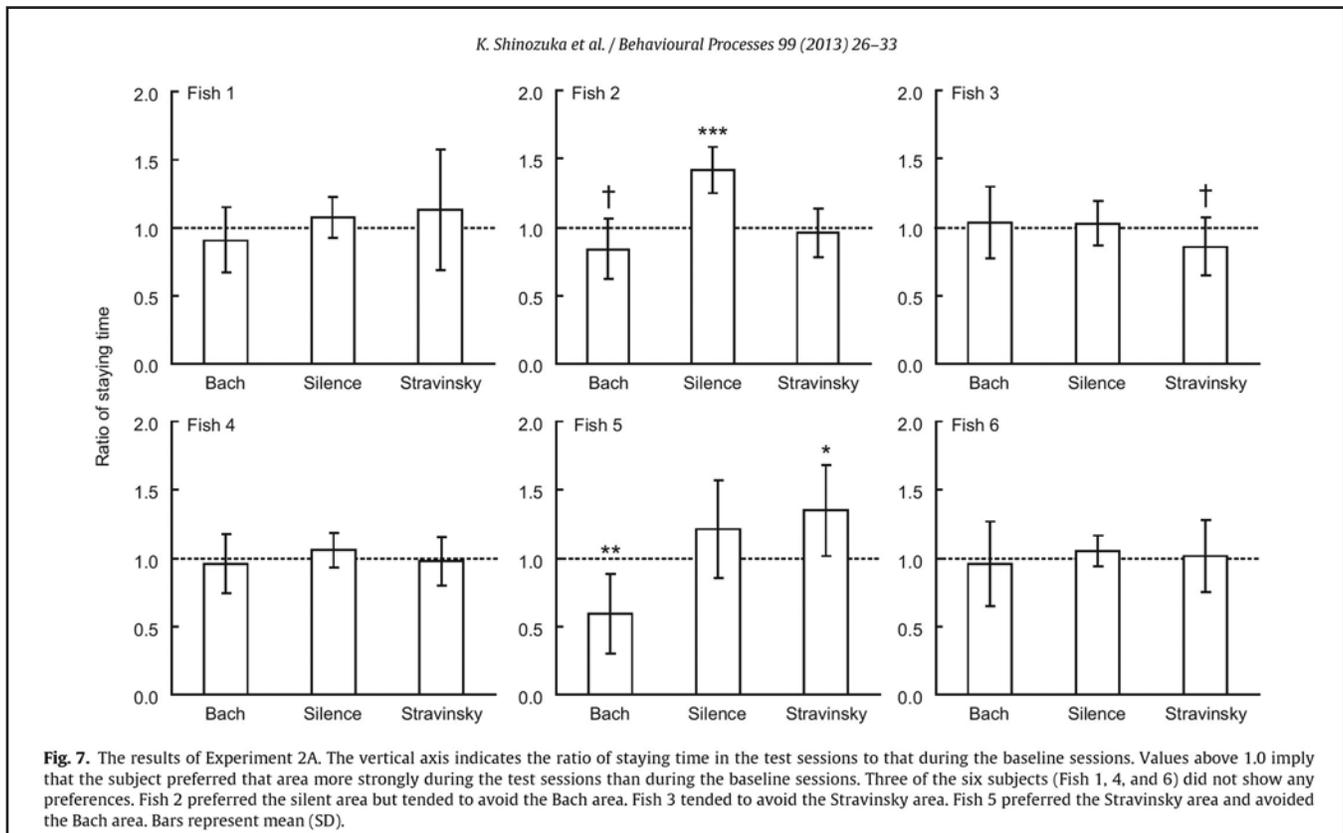
Assessing the influence of the multisensory environment on the whisky drinking experience

Carlos Velasco¹, Russell Jones², Scott King² and Charles Spence^{1*}

Abstract

Background: Flavor perception depends not only on the multisensory integration of the sensory inputs associated with the food or drink itself, but also on the multisensory attributes (or atmosphere) of the environment in which the food/drink is tasted. We report two experiments designed to investigate whether multisensory atmospheric cues could be used to influence the perception of a glass of whisky (that is, a complex but familiar product). The pre-test (experiment 1) was conducted in the laboratory and involved a sample of 18 participants (12 females, 5 males, and 1 who did not specify gender), while the main study (experiment 2) was conducted at a large purpose-designed whisky-tasting event held in London, and enrolled a sample of 441 participants (165 female, 250

RESULTS. Analysis of the data showed that each multisensory atmosphere/room exerted a significant effect on participants’ ratings of the attributes that the atmosphere/room had been designed to emphasize (namely grassiness, sweetness, and woodiness). Specifically, the whisky was rated as being significantly grassier in the Nose (‘grassy’) room, as being significantly sweeter in the Taste (‘sweet’) room, and as having a significantly woodier aftertaste in the Finish (‘woody’) room. Overall, the participants preferred the whisky when they tasted it in the Finish room.



Detail from the study “Reinforcing and Discriminative Stimulus Properties of Music in Goldfish.”



BOYS WILL BE BOYS

Research by and for adolescent males of all ages and sexes

compiled by Katherine Lee, Improbable Research staff

Pressure Distribution from Tight Underwear

“A Computing Model of Pressure Distribution from Tight Underwear,” Xiaonan Luo and Huimin Luo, *Journal of Computational and Applied Mathematics*, vol. 195, 2006, pp. 106–12. (Thanks to Nick Kim for bringing this to our attention.) The authors, who are at Sun Yat-Sen University in Guangzhou, Guangdong, China, report that:

Based on the theory of membrane of huge deformation in elasticity, a computable model is presented to solve the problem of pressure distribution on a human body from tight underwear. This model is steady and reliable.

Flatus in Fairly High Places

“High Altitude Syndromes at Intermediate Altitudes: A Pilot Study in the Australian Alps,” Graham Slaney, Angus Cook, and Philip Weinstein, *Medical Hypotheses*, vol. 81, 2013, pp. 547–50. (Thanks to Chris Daniels and Paul Willis for bringing this to our attention.) The authors, at Mansfield Medical Clinic, Mansfield, Victoria, Australia, and the University of Western Australia, report:

Our hypothesis is that symptoms of high altitude syndromes are detectable even at intermediate altitudes, as commonly encountered under Australian conditions (<2500 m above sea level)... To test this hypothesis we examined the relationship

A computing model of pressure distribution from tight underwear

Xiaonan Luo, Huimin Luo*

Computer Application Institute, Sun Yat-Sen University, Guangzhou, 510275 Guangdong, PR China

Received 15 August 2004; received in revised form 16 March 2005

Abstract

Based on the theory of membrane of huge deformation in elasticity, a computable model is presented to solve the problem of pressure distribution on a human body from tight underwear. This model is steady and reliable. With the help of this model, it is easy to solve the problem of describing wearing-dressed effect in Integrated Garments CAD system.

According to Hooker’s Law, the resultant stress of point A'_i on deformed underwear is P_i [10,11]

$$P_i = k_1 T_1 + k_2 T_2$$

T_1 and T_2 in above equation are stresses in the two stretched directions of the underwear

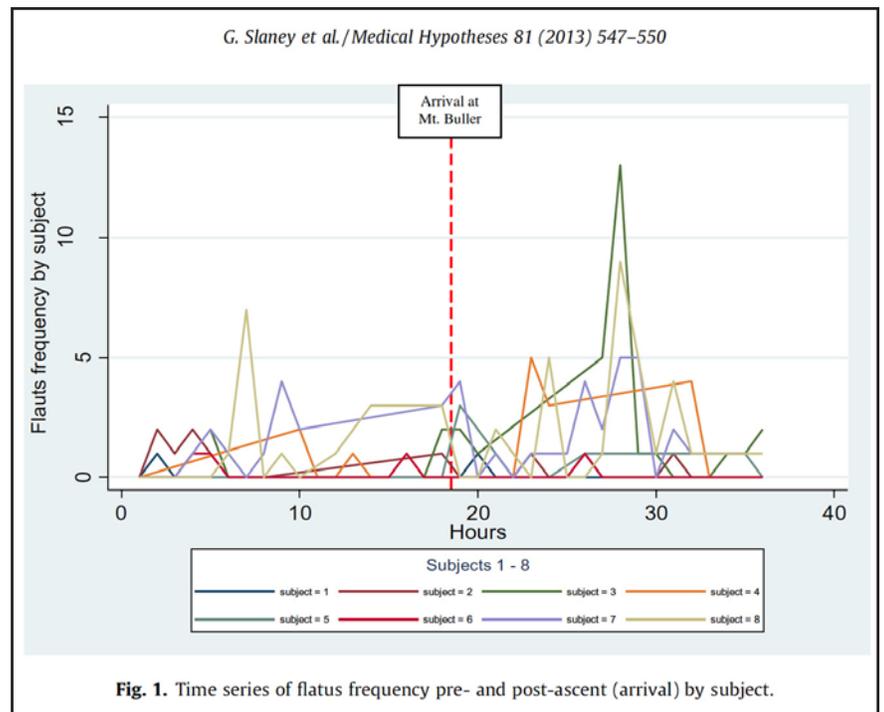
$$\begin{cases} T_1 = 2C_1 h \left(\frac{\lambda_1}{\lambda_2} - \frac{1}{\lambda_1^2 \lambda_2^2} \left(1 + \frac{C_1}{C_2} \lambda_2^2 \right) \right), \\ T_2 = 2C_2 h \left(\frac{\lambda_2}{\lambda_1} - \frac{1}{\lambda_1^2 \lambda_2^2} \left(1 + \frac{C_2}{C_1} \lambda_1^2 \right) \right), \end{cases}$$

Detail from the study “A Computing Model of Pressure Distribution from Tight Underwear.”

between any high altitude symptoms and a rapid ascent to an intermediate altitude (1800 m) by undertaking an intervention study in a cohort of eight medical clinic staff, conducted during July of the 2012 (Southern Hemisphere) ski season, using self-reporting questionnaires, at Mansfield (316 m above sea level) and at the Ski Resort of Mt Buller (1800 m), Victoria, Australia. The intervention consisted of ascent by car from Mansfield to Mt Buller (approx. 40 min drive)...

We found that the frequency of flatus production more than doubled following ascent, with a postascent frequency of approximately 14 expulsions per person over the 18 h recording period.

Detail from the study "High Altitude Syndromes at Intermediate Altitudes: A Pilot Study in the Australian Alps."



Heated Girl-vs.-Girl Body-Parts Competition, Investigated by Scholars

“Female Physical Characteristics and Intra-Sexual Competition in Women,” Bernhard Fink, Dominique Klappauf, Gayle Brewer, and Todd K. Shackelford, *Personality and Individual Differences*, vol. 58, 2014, pp. 138–41. (Thanks to Enrique Grenados for bringing this to our attention.) The authors, at the University of Göttingen, Germany, the University of Central Lancashire, U.K., and Oakland University, Rochester, Minnesota, U.S.A., explain:

Women engage in intra-sexual competition to attract or to retain a mate. Given men’s preferences for certain female physical characteristics, women may be attuned to potential rivals who display such traits. We examined how variation in facial femininity, breast size, and waist-to-hip ratio (WHR) affects perceived competition and attractiveness judgments in a sample of German female undergraduates. Thirty-five women ranked five images of each stimulus type according to perceived competition and rated these images for attractiveness and femininity. Women with more feminine faces, larger breasts, and lower WHRs received higher attractiveness and femininity ratings and were ranked highest on perceived competition. The results indicate the occurrence of human female intra-sexual competition with respect to physical traits desired by potential mates.

Detail from the study "High Altitude Syndromes at Intermediate Altitudes: A Pilot Study in the Australian Alps."

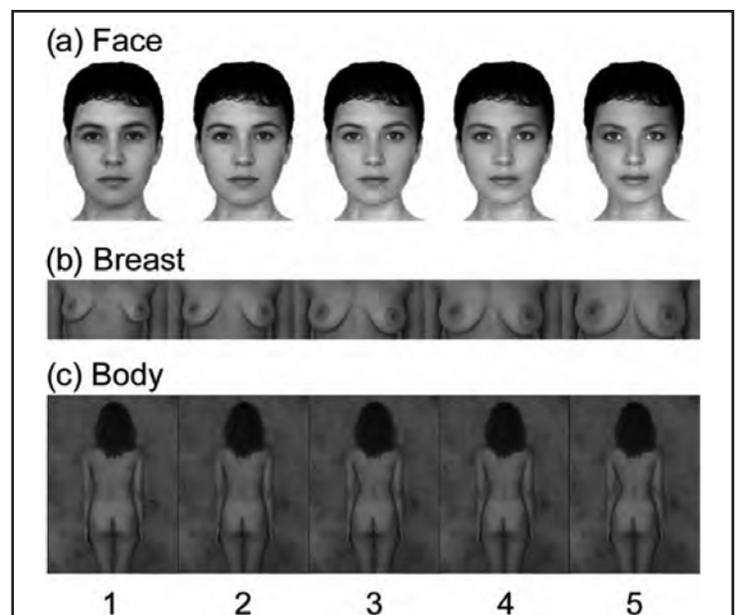


Fig. 1. Stimuli images of female faces, breasts and bodies. Faces: least feminine (1) to most feminine (5); Breasts: smallest (1) to largest (5); Bodies: highest WHR (1) to lowest WHR (5).

stimuli. Mauchly’s tests of sphericity indicated that the assumption of sphericity had been violated; thus Greenhouse-Geisser adjustments were applied to the degrees of freedom. Women with more feminine facial features ($F_{2,48,84.15} = 73.46, p < .001$), larger breasts ($F_{2,19,74.46} = 68.59, p < .001$), and a lower WHR ($F_{2,36,80.30} = 23.98, p < .001$) were perceived to pose the greatest threat. There was a main effect of facial femininity ($F_{3,03,103.01} = 37.20, p < .001$), breast size ($F_{2,54,86.20} = 50.41, p < .001$) and WHR ($F_{2,80,95.19} = 31.54, p < .001$) on attractiveness perception. Feminine faces, large breasts and bodies with low WHRs received higher attractiveness ratings, although the extremes were not always considered most attractive



E-books are in the AIR (and vice versa)

Download a free issue of the
Annals of Improbable Research at
www.improbable.com

Get additional issues from Barnes & Noble, Amazon, iTunes, or Kobo.
Comfy to read on big devices (computers) and tiny ones (phones), too.

Mel says: "It's swell."



Or subscribe to the lovely paper edition:

Please:

___ start or ___ renew a subscription FOR ME (___1 year (6 issues) ___2 years)

___ start or ___ renew a GIFT SUBSCRIPTION (___1 year (6 issues) ___2 years)

Print version (in US dollars) rates.

	1 year	2 years
USA	\$44	\$82
Canada/Mex	\$55	\$104
Overseas	\$72	\$133

My name, address, and all that:

Name: _____

Addr: _____

City: _____

State/Province: _____ ZIP: _____

Country: _____

Phone: _____

E-mail: _____

Payment

Total payment enclosed: _____

Method: ___ Check (drawn on US bank) or int'l money order

___ Mastercard ___ Visa ___ Discover

CARD #: _____

EXP. DATE: _____

I am giving a GIFT SUBSCRIPTION to:

Name: _____

Addr: _____

City: _____

State/Province: _____ ZIP: _____

Country: _____

Phone: _____

E-mail: _____

SEND TO: AIR



PO Box 380853
Cambridge MA 02238 USA

telephone: 617-491-4437

fax: 617-661-0927

WHEN DOES YOUR SUBSCRIPTION EXPIRE?

Your mailing label tells the final YEAR and ISSUE NUMBER of your current subscription. **FOR EXAMPLE:** "2014:5" or "201405" indicates the fifth issue of the year 2014.

subscriptions@improbable.com
www.improbable.com

IG® NOBEL LIMERICKS: MULTITUDINOUS AUTHORS, JERK, AND INTESTINAL CLOG

Ig Nobel Achievements distilled into limerick form

by Martin Eiger, *Improbable Research Limerick Laureate*

The Ig Nobel Prizes honor achievements that first make people laugh, then make them think. For details of all the Ig Nobel Prize-winning achievements, see each year's special Ig Nobel issue of the magazine, and also see www.improbable.com/ig/winners.

1993 Ig Nobel Literature Prize

Eric Topol, R. Califf, F. Van de Werf, P. W. Armstrong, and their 972 co-authors, for publishing a medical research paper which has one hundred times as many authors as pages.

[The study was published in *The New England Journal of Medicine*, vol. 329, no. 10, September 2, 1993, pp. 673–82.

The authors are from the following countries: Australia, Belgium, Canada, France, Germany, Ireland, Israel, Luxembourg, the Netherlands, New Zealand, Poland, Spain, Switzerland, United Kingdom, United States.]

ON TOP'S WHERE THE TITLE SHOULD GO.

THEN LIST ALL THE AUTHORS BELOW.

SHOULD THE ABSTRACT AND TEXT

OF THE PAPER COME NEXT?

IF YOU'VE RUN OUT OF ROOM FOR THEM, NO.

You Bastard: A Narrative Exploration of the Experience of Indignation within Organizations

David Sims

Abstract

Our patience with forming interpretations and reinterpretations of others' behaviour is not unlimited. The time comes when we lose interest in trying to understand, and conclude that another person is behaving in a way that is simply unacceptable. This paper explores the narratives that go with immoderate indignation, even for those best

2008 Ig Nobel Literature Prize

David Sims of Cass Business School, London, U.K., for his lovingly written study "You Bastard: A Narrative Exploration of the Experience of Indignation within Organizations."

[The full citation for the study: "You Bastard: A Narrative Exploration of the Experience of Indignation within Organizations," David Sims, *Organization Studies*, vol. 26, no. 11, 2005, pp. 1625–40.]

THE PEOPLE I WORK WITH ARE CRASS.

MY BOSS IS A PAIN IN THE ASS.

NOW THAT BASTARD, THAT JERK,

IS BRINGING TO WORK

SOME DUMB ANGER MANAGEMENT CLASS.

1994 Ig Nobel Biology Prize

W. Brian Sweeney, Brian Krafte-Jacobs, Jeffrey W. Britton, and Wayne Hansen, for their breakthrough study, "The Constipated Serviceman: Prevalence Among Deployed US Troops," and especially for their numerical analysis of bowel movement frequency. [Published in *Military Medicine*, vol. 158, August, 1993, pp. 346-348.]

WE THANK THEM FOR SERVING THE NATION.

WE OWE THEM SOME QUANTIFICATION.

THEY MAY WANT TO KNOW

HOW OFTEN THEY GO,

AND CONVERSELY, HOW MUCH CONSTIPATION.

MILITARY MEDICINE. 158. 8:546. 1993

The Constipated Serviceman: Prevalence among Deployed U.S. Troops

*LCDR W. Brian Sweeney, MC USNR**
Brian Krafte-Jacobs, MD†

LCDR Jeffrey W. Britton, MC USNR‡
LT Wayne Hansen, NC USN§

The prevalence of constipation in deployed servicemen was determined in a sample of military personnel aboard the USS *Iwo Jima LPH 2* during Operation Desert Shield. Results were obtained from a bowel function questionnaire issued to 500 deployed marines and sailors. When constipation is defined as

obtained, and each of three pages asked the same meal- and bowel function-related questions for three environments—home, ship, and field. Specifically asked was the number of meals eaten daily, the frequency of bowel movement, and the consistency of bowel movements (choices being liquid, soft,

PUZZLING SOLUTIONS

Solution to Last Month's Puzzler

by Emil Filterbag, Improbable Research staff



BECAUSE THE BODIES ARE MISSING.

INDEX of SPECIAL ISSUES

- | | | | |
|--|---|---|--|
| AIR 1:1 – Premier Issue | AIR 6:3 – Crime & Punishment | AIR 11:2 – Puzzling Solutions | AIR 15:6 – 19th First Annual Ig Nobel Prizes |
| AIR 1:2 – Teachers' Issue | AIR 6:4 – Postage & Handling | AIR 11:3 – Security | AIR 16:1 – Beards & Bagels & Paper Airplanes |
| AIR 1:3 – Food Issue | AIR 6:5 – Bomby the Bombardier Beetle | AIR 11:4 – Snails & Cookies | AIR 16:2 – Geography & Teabagging |
| AIR 1:4 – Paleontology Issue | AIR 6:6 – Eccentrics Issue | AIR 11:5 – Harry Potter & the Exploding Toads | AIR 16:3 – Orgy & Handwashing |
| AIR 1:5 – Pediatrics Issue | AIR 7:1 – 10th First Annual Ig Nobel Prizes/Sweetie-Poo Issue | AIR 11:6 – 15th First Annual Ig Nobel Prizes | AIR 16:4 – Mathematics |
| AIR 1:6 – Animal Behavior Issue | AIR 7:2 – YAVIS Psychology | AIR 12:1 – Fame & Fortune | AIR 16:5 – Skunk & Canyon |
| AIR 2:1 – 5th First Annual Ig Nobel Prizes | AIR 7:3 – Physics | AIR 12:2 – Painting | AIR 16:6 – 20th First Annual Ig Nobel Prizes |
| AIR 2:2 – Annual Swimsuit Issue | AIR 7:4 – Behavior | AIR 12:3 – Fish & Chips | AIR 17:1 – Missing Pieces |
| AIR 2:3 – Symmetra Cover Issue | AIR 7:5 – Animal & Vegetable | AIR 12:4 – The Issue | AIR 17:2 – Head & Brain |
| AIR 2:4 – Typo Issue. | AIR 7:6 – Holy Grail | AIR 12:5 – Anatomy | AIR 17:3 – Mathematicians & Bears |
| AIR 2:5 – Generic Issue | AIR 8:1 – 11th First Annual Ig Nobel Prizes/Wedding Issue | AIR 12:6 – 16th First Annual Ig Nobel Prizes | AIR 17:4 – Professor Lipscomb |
| AIR 2:6 – Martian Meteorite Issue | AIR 8:2 – Pizza, Sex & TV (and Cheese) | AIR 13:1 – Coke & Pepsi & Coli | AIR 17:5 – Animal Oddities |
| AIR 3:1 – 6th First Annual Ig Nobel Prizes | AIR 8:3 – Nano-Friendship | AIR 13:2 – Theoretical Figures | AIR 17:6 – 21st First Annual Ig Nobel Prizes |
| AIR 3:2 – Annual Swimsuit Issue | AIR 8:4 – Wiener Sausage | AIR 13:3 – Rivalry | AIR 18:1 – Body Parts |
| AIR 3:3 – Managed Health Care | AIR 8:5 – Smelly Issue | AIR 13:4 – What's in Your Head | AIR 18:2 – And More Body Parts |
| AIR 3:4 – Peculiar Patents | AIR 8:6 – Art & Science | AIR 13:5 – Meaning of the Finger | AIR 18:3 – Randomness vs. Stupidity |
| AIR 3:5 – How-To | AIR 9:1 – 12th First Annual Ig Nobel Prizes | AIR 13:6 – 17th First Annual Ig Nobel Prizes | AIR 18:4 – Projectiles |
| AIR 3:6 – Parapsychology | AIR 9:2 – Dismal Science | AIR 14:1 – Reclassification/Renaming | AIR 18:5 – Alcohol Consumption |
| AIR 4:1 – 7th First Annual Ig Nobel Prizes | AIR 9:3 – Everything | AIR 14:2 – Writing Research | AIR 18:6 – 22nd First Annual Ig Nobel Prizes |
| AIR 4:2 – Annual Swimsuit Issue | AIR 9:4 – Chicken & Fish | AIR 14:3 – Anti-Terrorism | AIR 19:1 – Sloths & Vampires |
| AIR 4:3 – Cough & Apology | AIR 9:5 – Murphy's Law | AIR 14:4 – Colorful Research | AIR 19:2 – Blushing |
| AIR 4:4 – Animal Behavior | AIR 9:6 – 13th First Annual Ig Nobel Prizes | AIR 14:5 – Dots and Spots | AIR 19:3 – Boring Machines |
| AIR 4:5 – Social Science | AIR 10:1 – Beauty | AIR 14:6 – 18th First Annual Ig Nobel Prizes | AIR 19:4 – Italian Hand Gestures |
| AIR 4:6 – Math & Money | AIR 10:2 – Way To Go | AIR 15:1 – Mummies, Zombies, & Bagels | AIR 19:5 – Tolstoy's Rifles |
| AIR 5:1 – 8th First Annual Ig Nobel Prizes | AIR 10:3 – Loss of Innocence | AIR 15:2 – Navel Lint Issue | AIR 19:6 – 23rd First Annual Ig Nobel Prizes |
| AIR 5:2 – Annual Swimsuit Issue | AIR 10:4 – Astronomy | AIR 15:3 – Accounting Issue | AIR 20:1 – Miscerant Trapping |
| AIR 5:3 – Movie Issue | AIR 10:5 – Cats | AIR 15:4 – Instructions & Executions | AIR 20:2 – Cloning & Evolution |
| AIR 5:4 – Coffee & Tea | AIR 10:6 – 14th First Annual Ig Nobel Prizes | AIR 15:5 – Helmets & Lost Planets | AIR 20:3 – Centrifugal Research |
| AIR 5:5 – Bearded Men | AIR 11:1 – Yawning | | |
| AIR 5:6 – Education | | | |
| AIR 6:1 – 9th First Annual Ig Nobel Prizes | | | |
| AIR 6:2 – Crabs & UFOs | | | |

Get **NEW** ISSUES and some **BACK ISSUES** as delightful **E-BOOKS**. Download a **FREE ISSUE** at **IMPROBABLE.COM**



Annals of Improbable Research
PO Box 380853, Cambridge, MA 02238 USA

(+1) 617-491-4437 FAX: (+1) 617-661-0927 <air@improbable.com>

Teachers:

You have our permission – and encouragement – to photocopy *AIR* articles and hand them out in your classroom.



Annals of Improbable Research (ISSN 1079-5146 print / 1935-6862 online) is published six times per year (Jan./Feb., Mar./Apr., May/June, July/Aug., Sep./Oct., Nov./Dec.) by

Improbable Research, Inc.,
44-C Sacramento St.
P.O. Box 380853,
Cambridge, MA 02238 USA
617-491-4437
FAX: 617-661-0927
<subscriptions@improbable.com>

©Copyright 2014 Annals of Improbable Research.

Subscription rates for the paper edition:
US — \$44; Canada and Mexico — \$55;
Overseas — \$72.

PERIODICALS postage paid at Boston MA and additional mailing offices.

Change of address: Postmaster please send address changes to: *Annals of Improbable Research*, PO Box 380853, Cambridge MA 02238.

Claims for missing issues: Claims will be serviced at no charge if received within 90 days of the cover date for domestic subscribers and six months for subscribers outside the US. Duplicate copies cannot be sent to replace issues not delivered because of failure to notify publisher of change of address.

Cancellation: Subscription cancellations will not be accepted after the first issue has been mailed.

Mastication: *AIR* is not necessarily printed on edible stock. Mastication is not recommended except under a physician's care.

Language of this notice: This notice is printed in English.

IMPORTANT: *AIR* was created by the founders and entire former editorial staff (1955-1994) of *The Journal of Irreproducible Results*. However, *AIR* is in no way associated with that publication or with its publisher, nor should *AIR* in any way be confused with either of those entities.

UNCLASSIFIED ADS

The Annals of Improbable Research disclaims any and all responsibility for the veracity, existence, safety, or sense of any or all contents or consequences of these advertisements. Proceed at your own risk.

The Recovering Alcoholic's Guide to Topological Manifolds (2st edition, signed by author). BOX 2

Small hadron collider, slightly used. Has cosmetic damage but is otherwise fully functional. BOX 4.

The Recovering Alcoholic's Guide to Pleasing Fungus beetles (1st edition, signed by author). BOX 5.

The Recovering Alcoholic's Guide to the Fourteen Moons of Neptune (1st edition, signed by author). BOX 6.

101 Favorite Piccolo Solos for Tinnitus Sufferers [sheet music]. BOX 7.

Contents of Box 10 (Guaranteed no more than four leeches!). BOX 10.

Dirty books. Soil ideal for growing legumes. BOX 17.

Book—*The Religious Impulse in Bacteria*, by B.H. and L.L. ("Petit Homme") Legrande, signed second edition. BOX 19.

Detritus. Box 20.

MOOCS for Mooks (3-DVD set, includes cleaning fluid). Box 21.

Lug nut extravaganza. Write for our catalog. BOX 22.

Book—*The Indecent Docent*, fourth edition, signed by a reader. BOX 45.

Homemade zygotes. Just like Mom's. BOX 48.

...and more, on our web site
www.improbable.com

- daily blog
- newspaper column*
- monthly newsletter (mini-AIR)

* Appearing in *The Guardian* (London) and online

What is this picture? (see page 1)

