



# UIDP

Knoxville, TN

October 15, 2015

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# Journal citations are the traditional form of Scholarly Measure

Journal Impact Factor 3.161

**Elastic ice shells of synchronous moons: Implications for cracks on Europa and non-synchronous rotation of Titan**  
 Peter M. Goldreich <sup>a,b</sup>, Jonathan L. Mitchell <sup>a,b</sup>

**Abstract**

A number of synchronous moons are thought to harbor water oceans beneath their outer ice shells. A subsurface ocean frictionally decouples the shell from the interior. This has led to proposals that a weak tidal or atmospheric torque might cause the shell to rotate differentially with respect to the synchronously rotating interior. Applications along these lines have been made to Europa and Titan. However, the shell is coupled to the ocean by an elastic torque. As a result of centrifugal and tidal forces, the ocean would assume an ellipsoidal shape with its long axis aligned toward the parent planet. Any displacement of the shell away from its equilibrium position would induce strains thereby increasing its elastic energy and giving rise to an elastic restoring torque. In the investigation reported on here, the elastic torque is compared with the tidal torque acting on Europa and the atmospheric torque acting on Titan.

**References**

Anderson, J. D., Schubert, G., Jacobson, R. A., Lau, E. L., Moore, W. B., Sjogren, W. L., Sep. 1998. Europa's Differentiated Internal Structure: Inferences from Four Galileo Encounters. *J. Geophys. Res.* **103**, 15883-15919.

Greenberg, R., Hoppa, G., Helfenstein, P., McEwen, A., Pappalardo, R., Tufts, R., Ockert-Bell, M., Sullivan, R., Greeley, R., Belton, M. J. S., Denk, T., Clark, B. E., Burns, J., Veverka, J., Jan. 1998. Evidence for non-synchronous rotation of Europa. *Nature* **391**, 368.

Ghatak, A., Mahadevan, L., Nov. 2000. Crack Streets: The Cycloidal Wake of a Cylinder Tearing through a Thin Sheet. *Physical Review Letters* **91** (21), 215507.

Greeley, R., Sullivan, R., Coon, M. D., Geissler, P. E., Tufts, B. R., Head, J. W., Pappalardo, R. T., Moore, J. M., Sep. 1998. Terrestrial Sea Ice Morphology: A Guide to Europa. *Icarus* **140**, 205-262.

Greenberg, R., Hoppa, G. V., Tufts, B. R., Geissler, P., Riley, J., Kadel, S., Oct. 1999. Chaos on Europa. *Icarus* **141**, 263-286.

Greenberg, R., Weidenschilling, S. J., May 1984. How fast do Galilean satellites spin? *Planet. Space* **26**, 187-195.

**Europa's Differentiated Internal Structure: Inferences from Four Galileo Encounters**  
 J. D. Anderson, G. Schubert, R. A. Jacobson, E. L. Lau, W. B. Moore, W. L. Sjogren

**Abstract**

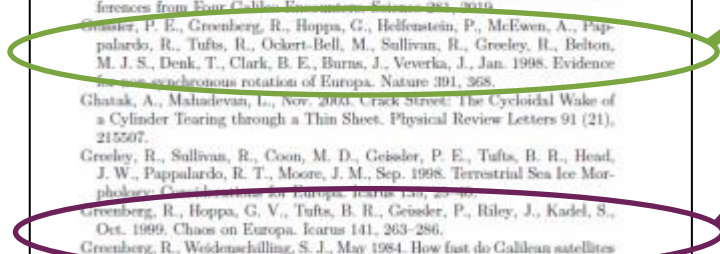
The Galileo mission has revealed the existence of a subsurface ocean beneath the outer ice shell of Europa. This has led to proposals that a weak tidal or atmospheric torque might cause the shell to rotate differentially with respect to the synchronously rotating interior. Applications along these lines have been made to Europa and Titan. However, the shell is coupled to the ocean by an elastic torque. As a result of centrifugal and tidal forces, the ocean would assume an ellipsoidal shape with its long axis aligned toward the parent planet. Any displacement of the shell away from its equilibrium position would induce strains thereby increasing its elastic energy and giving rise to an elastic restoring torque. In the investigation reported on here, the elastic torque is compared with the tidal torque acting on Europa and the atmospheric torque acting on Titan.

Parameter	Value
Europa's radius	1560 km
Europa's moment of inertia	1.2 × 10 <sup>34</sup> kg m <sup>2</sup>
Europa's mass	4.8 × 10 <sup>22</sup> kg
Europa's density	3.0 g/cm <sup>3</sup>
Europa's surface gravity	1.3 m/s <sup>2</sup>
Europa's tidal torque	1.5 × 10 <sup>18</sup> N m
Europa's atmospheric torque	1.0 × 10 <sup>18</sup> N m
Europa's elastic torque	1.0 × 10 <sup>18</sup> N m

**Residual Sea Ice Morphology Considerations for Europa**  
 R. Greeley, M. J. S. Belton, M. D. Coon, J. W. Head, J. M. Moore, P. E. Geissler, P. H. Schultz, J. D. Anderson, J. L. Mitchell, P. Helfenstein, G. V. Hoppa, G. Greenberg, R. Tufts, B. R. Sullivan, R. Ockert-Bell, M. A. Belton, M. J. S. Denik, T. Clark, B. E. Burns, J. Veverka, J. Jan. 1998. Evidence for non-synchronous rotation of Europa. *Nature* **391**, 368.

**Abstract**

Residual sea ice morphology on Europa is considered in the context of tidal and atmospheric torques. It is shown that the observed morphology is consistent with a model in which the ice shell is elastically coupled to a subsurface ocean. This model predicts a characteristic pattern of cracks and ridges that is observed on Europa.



ONLINE IN  
**60**  
SECONDS  
A YEAR LATER



**Qmee.com**

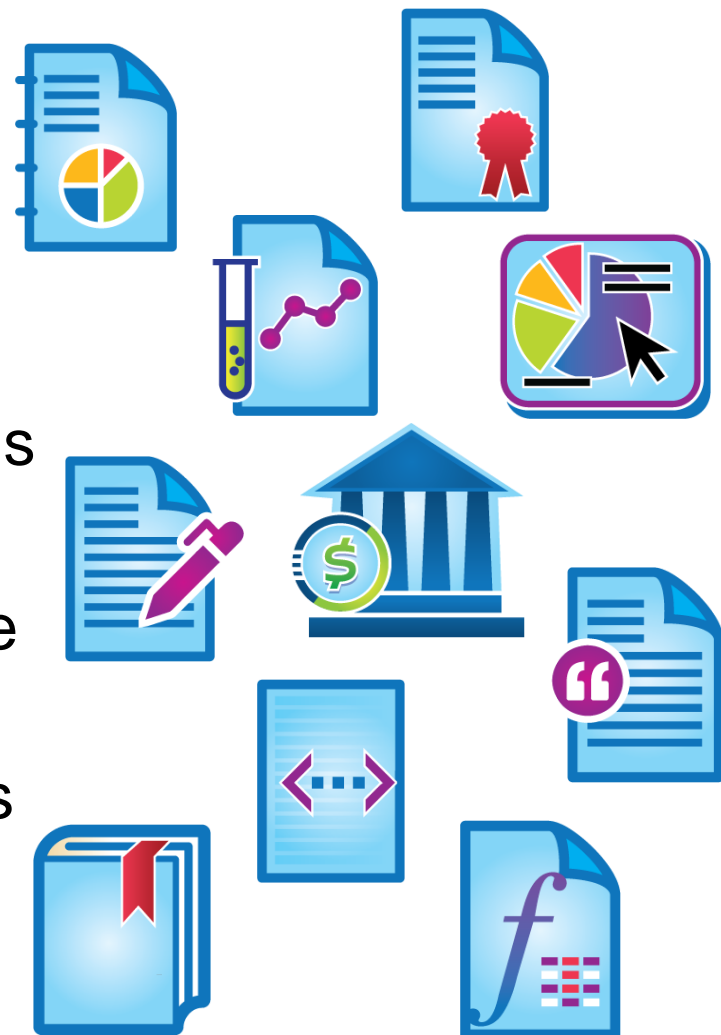
DATA  
[www.internetlivestats.com](http://www.internetlivestats.com)  
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*Measuring data exhaust to tell the story...*






























# **Technology Has Finally Caught Up**

# What is Research Output?

- Articles
- Blog posts
- Book chapters
- Books
- Cases
- Clinical Trials
- Conference Papers
- Data Sets
- Figures
- Grants
- Interviews
- Letters
- Media
- Patents
- Posters
- Presentations
- Reports
- Source Code
- Theses / Dissertations
- Videos
- Web Pages



# Samples of PlumX Metrics Sources

-  Amazon
-  Bit.ly
-  CrossRef
-  Delicious
-  Dryad
-  dSpace
-  EBSCO
-  ePrints
-  Facebook
-  figshare
-  Github
-  Goodreads
-  Google+
-  Medwave
-  Mendeley
-  PLOS
-  PubMed Central
-  Reddit
-  Research Blogging
-  Scopus
-  SlideShare
-  SourceForge
-  Stack Overflow
-  Twitter
-  USPTO
-  Vimeo
-  Wikipedia
-  Worldcat (OCLC)
-  YouTube

# PLUMx

## Metrics

### Categories



### USAGE

(clicks, downloads, views,  
library holdings, video plays)



### CAPTURES

(bookmarks, code forks, favorites,  
readers, watchers)



### MENTIONS

(blog posts, comments, reviews,  
Wikipedia links)



### SOCIAL MEDIA

(+1s, likes, shares, tweets)

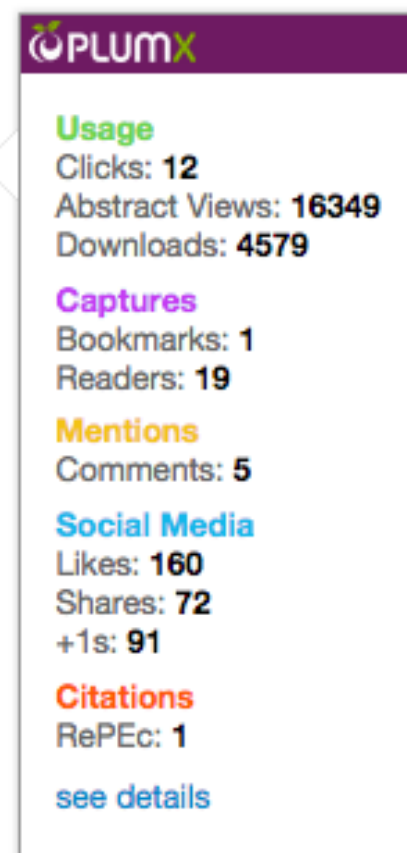


### CITATIONS

(PubMed Central, Scopus,  
patents)

# Visualizing Impact: Plum Print

- Includes the 5 categories of metrics
- Circles dynamically change size based on metrics in each category





# CATEGORIZE

- By metrics type
- By type of output
- By YOUR categories (e.g. department, subject, grant)

# MEASURE

- PlumX platform automatically gathers **metrics** about each category for each artifact

# ANALYZE



## Paul Ashwood

### Researcher from:

By Geography / USA / California / 7567

By Institution / University of California, Davis / 7567

By Portfolio / Biology / 7567

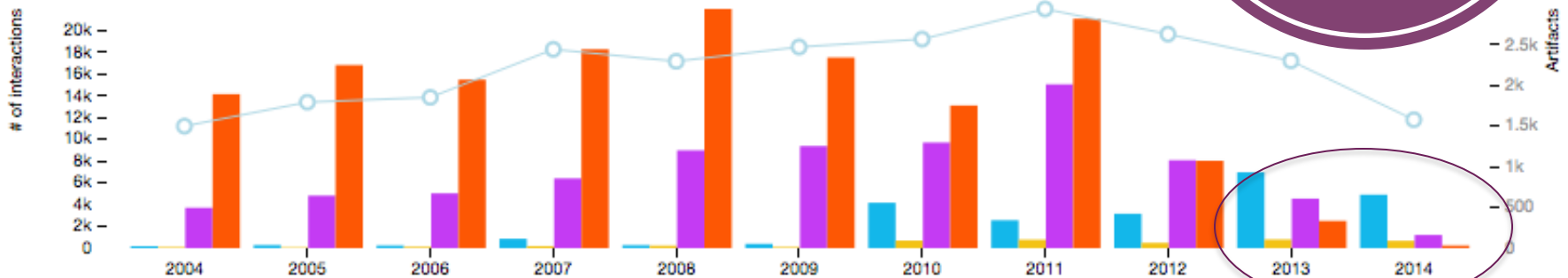
By Proposal Type / Trailblazer / 7567

Year ▼	Title	Type	All				
			Captures +	Citations +	Social Media +	Mentions +	Usage +
2014	Gastrointestinal problems in children with autism, developmental delays or typical development.	Article	10		37	9	385
2013	Microbiota modulate behavioral and physiological abnormalities associated with neurodevelopmental disorders.	Article	340	17	143	36	308
2013	Myeloid dendritic cells frequencies are increased in children with autism spectrum disorder and associated with amygdala volume and repetitive behaviors.	Article	5	4	12	8	233
2013	Antibodies against food antigens in patients with autistic spectrum disorders.	Article	12	2	181	21	10
2013	Maternal immune activation causes age- and region-specific changes in brain cytokines in offspring throughout development.	Article	23	18	8	2	199
2013	Cannabinoid receptor type 2, but not type 1, is up-regulated in peripheral blood mononuclear cells of children affected by autistic disorders.	Article	4	9	63	16	1154
2013	Cytokine dysregulation in autism spectrum disorders (ASD): possible role of the environment.	Article	18	15	1		234
2013	'Friendly' bacteria treat autism-like symptoms in mice SFARI.org Simons Foundation Autism Research Initiative	Article			473	131	39
2013	Zonulin as prehaptoglobin2 regulates lung permeability and activates the complement system.	Article	6	4			15

# ANALYZE

Showcase impact in the past 12 to 24 months.

Metrics by publication year



	Social Media	Mentions	Captures	Citations	Artifacts
2014	4901	669	1204	228	1575
2013	6954	790	4541	2492	2297
2012	3152	479	8067	8015	2625
2011	2555	773	15029	21049	2934
2010	4161	689	9685	13086	2563
2009	386	95	9361	17489	2467
2008	262	221	8968	21950	2291
2007	852	180	6394	18243	2438
2006	234	115	5025	15457	1849
2005	269	64	4816	16795	1790
2004	174	89	3701	14132	1496

# Autism Speaks



FAMILIES & ADULTS ▾

**RESEARCH** ▲

ADVOCATE ▾

GET INVOLVED ▾



## Autism Speaks and WHO take Parent Skills Training to China



## Autism Science Foundation launches Autism Sisters Project



## The Autism Speaks MSSNG Project: Changing the Future of Autism with Open Science

### See all Research

Apply for Grants & Fellowships

Autism Treatment Network

DELSIA

Search Grants We've Funded

Find Resources & Programs

Participate in Research

PACT

Policy Statements

Professional Development Resources

Science Blogs

Science Department Leadership

Science News

Scientific Advisory Board

Grants Metrics

Get the latest on research, programs, services, walks and special events in your area.

# PlumX – Autism Speaks

PLUMX

Autism Speaks

Groups



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## Autism Speaks

Autism Speaks is using PlumX to track the metrics on the research outputs that its funding has helped create.

PlumX gathers metrics about each grant across 5 categories of impact: usage, captures, mentions, social media, and citations. These metrics tell a story about how the findings from our funding are being used... + More

### Artifact Summary

1099



Article

57



Video

54



Blog

21



Conference

20

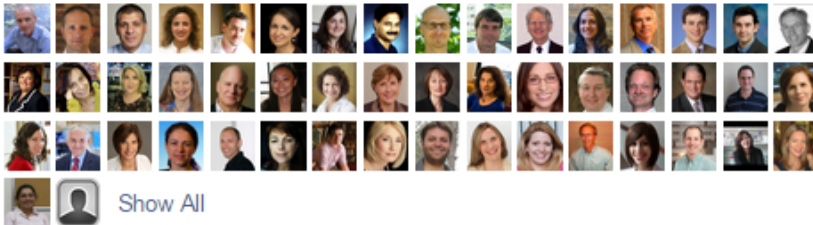


Web

### Researchers:

+ Add Researcher

Showing 50 of 649



Show All

### Narrow by:

+ Add Subgroup

Showing 6 of 6

- By Geography
- By Institution
- By Portfolio
- By Proposal Type
- By Special Groups
- Major Gifts

### Grants:

+ Add Grant

- ATN 2011- KKI
- Identifying Genetic Variants on the Y Chromosome of Males with Autism
- Genome-wide examination of DNA methylation

### Funding opportunities:

+ Add Search



## Helping our Teens with Autism Sleep

Publication Year: 2014

Researchers: Beth Malow

Grant: ATN 2011- Vanderbilt University

USAGE <span>⌵</span>	534	MENTIONS <span>⌵</span>	115	SOCIAL MEDIA <span>⌵</span>	2282
Clicks <span>⌵</span>	534	Comments <span>⌵</span>	115	Likes <span>⌵</span>	1393
				Shares <span>⌵</span>	834
				Tweets <span>⌵</span>	53
				+1s <span>⌵</span>	2

ABOUT THIS BLOG



**Sherry Thomas**

@SherryBaby365



+ Follow

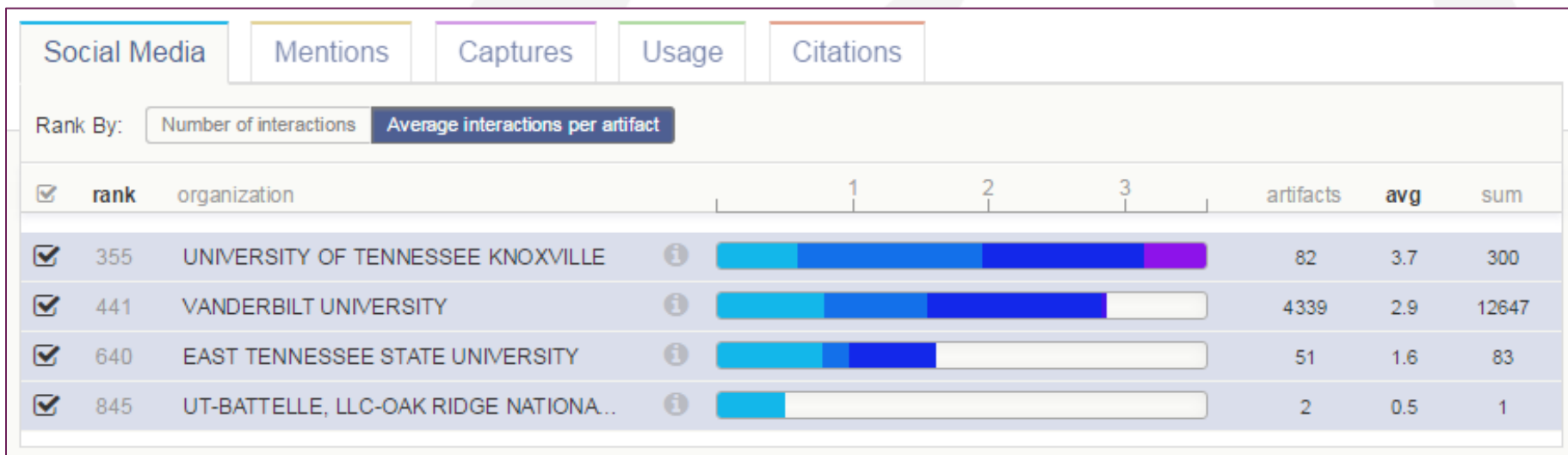
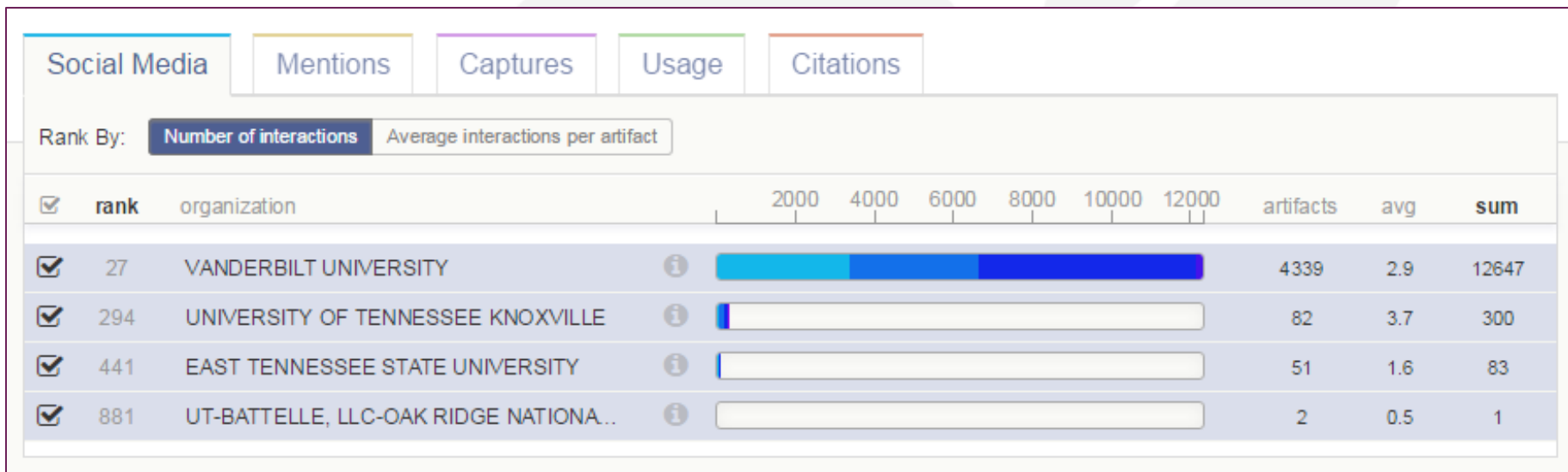
"@autismspeaks: Great new toolkit available focused on helping our teens with autism sleep >> [shar.es/Pch4d](http://shar.es/Pch4d) #autism #awareness"

8:47 AM - 9 Jun 2014

📍 Missouri, USA



# Benchmark





# Article example



PlumX Benchmarks

Groups ▾ ⚙ ▾



## Incorporation of therapeutically modified bacteria into gut microbiota inhibits obesity.

Citation data: The Journal of clinical investigation, ISSN: 0021-9738, Vol: 124, Issue: 8, Page: 3391-406

Publication Year: 2014

Grants:

Analytical Resources Core, Complications and Pathology Core, Therapeutically Modified Gut Bacteria for Treatment of Obesity, Enrichment, Training, and Outreach Program

USAGE ▾	388	CAPTURES ▾	159	MENTIONS ▾	90	SOCIAL MEDIA ▾	399	CITATIONS ▾	11
Abstract Views ◉	287	Readers ◉	145	Comments ◉	89	Likes ◉	156	Cited by ◉	11
Link-outs ◉	58	Exports-Saves ◉	14	Economics Blog Mentions ◉	1	Tweets ◉	102		
Clicks ◉	43					Shares ◉	86		
						+1s ◉	55		

### ABOUT THIS ARTICLE

#### GROUPS:

##### By Spending Category

- ◉ Nutrition
- ◉ Genetics
- ◉ Complementary and Alternative Medicine

#### STABLE URL:

plu.mx/a/5TnAKXYS6fag0OFLIDySYFOjUnCQdPzsXTghmcpStwM

#### PMID:

#### MOST RECENT TWEET




**Melinda M. Sörensson**  
@sorensson

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## Bacteria Could Provide A Powerful New Way To Fight Fat And Depression

Lauren F Friedman   

🕒 Jul. 9, 2014, 11:06 AM 🔥 14,526 💬 4



FACEBOOK



LINKEDIN



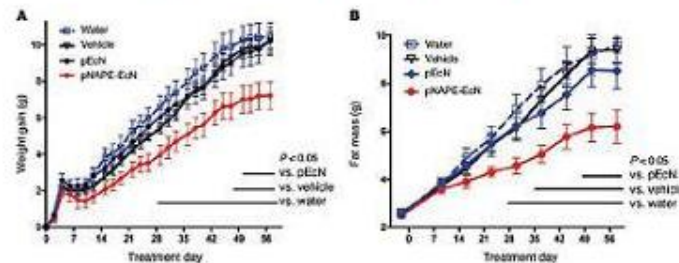
**Tobias Fromme**

@FrommeLab



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JCI - Incorporation of therapeutically modified bacteria into gut microbiota inhibits obesity [buff.ly/1opfDyu](http://buff.ly/1opfDyu)



RETWEET

1

FAVORITE

1



# Discover - Nanotechnology

Social Media

Mentions

Captures

Usage

Citations

Rank By: **Number of interactions** Average interactions per artifact

<input checked="" type="checkbox"/>	rank	organization		2000	4000	6000	8000	10000	12000	artifacts	avg	sum
<input type="checkbox"/>	1	UNIVERSITY OF CALIFORNIA LOS ANGE...	<a href="#">i</a>							437	28.1	12271
<input type="checkbox"/>	2	MASSACHUSETTS INSTITUTE OF TECH...	<a href="#">i</a>							180	61.2	11023
<input type="checkbox"/>	3	JOHNS HOPKINS UNIVERSITY	<a href="#">i</a>							268	27.7	7421
<input type="checkbox"/>	4	STANFORD UNIVERSITY	<a href="#">i</a>							148	48.2	7130
<input type="checkbox"/>	5	UNIVERSITY OF CALIFORNIA SAN DIEGO	<a href="#">i</a>							145	46.1	6688
<input type="checkbox"/>	6	NORTHWESTERN UNIVERSITY AT CHIC...	<a href="#">i</a>							246	26.9	6619
<input type="checkbox"/>	7	HARVARD MEDICAL SCHOOL	<a href="#">i</a>							98	59.2	5801
<input type="checkbox"/>	8	UNIV OF NORTH CAROLINA CHAPEL HILL	<a href="#">i</a>							154	27.2	4188
<input type="checkbox"/>	9	HARVARD UNIVERSITY	<a href="#">i</a>							35	114.9	4023
<input type="checkbox"/>	10	UNIVERSITY OF NEBRASKA MEDICAL C...	<a href="#">i</a>							142	28.2	3999

# Discover - Food Safety

Social Media

Mentions

Captures

Usage

Citations

Rank By: **Number of interactions** Average interactions per artifact

<input checked="" type="checkbox"/>	rank	organization		1000	2000	3000	4000	5000	artifacts	avg	sum
<input type="checkbox"/>	1	UNIVERSITY OF PENNSYLVANIA	<a href="#">i</a>						70	81.9	5732
<input type="checkbox"/>	2	NIAID EXTRAMURAL ACTIVITIES	<a href="#">i</a>						165	28.2	4649
<input type="checkbox"/>	3	DARTMOUTH COLLEGE	<a href="#">i</a>						97	46.5	4510
<input type="checkbox"/>	4	MASSACHUSETTS GENERAL HOSPITAL	<a href="#">i</a>						91	42.0	3820
<input type="checkbox"/>	5	COLUMBIA UNIVERSITY HEALTH SCIEN...	<a href="#">i</a>						105	33.6	3526
<input type="checkbox"/>	6	UNIVERSITY OF WASHINGTON	<a href="#">i</a>						52	62.7	3261
<input type="checkbox"/>	7	CINCINNATI CHILDRENS HOSP MED CTR	<a href="#">i</a>						82	37.0	3036
<input type="checkbox"/>	8	WEILL MEDICAL COLL OF CORNELL UNIV	<a href="#">i</a>						38	79.9	3035
<input type="checkbox"/>	9	UNIVERSITY OF VIRGINIA	<a href="#">i</a>						75	36.7	2753
<input type="checkbox"/>	10	ENVIRONMENTAL HEALTH SCIENCES	<a href="#">i</a>						41	66.4	2723

# Discover - Pain Research

Social Media

Mentions

Captures

Usage

Citations

Rank By: **Number of interactions** Average interactions per artifact

<input checked="" type="checkbox"/>	rank	organization		2000	4000	6000	8000	10000	artifacts	avg	sum
<input type="checkbox"/>	1	UNIVERSITY OF CALIFORNIA, SAN FRAN...	<a href="#">i</a>						299	35.8	10890
<input type="checkbox"/>	2	JOHNS HOPKINS UNIVERSITY	<a href="#">i</a>						293	35.5	10400
<input type="checkbox"/>	3	DUKE UNIVERSITY	<a href="#">i</a>						187	50.8	8480
<input type="checkbox"/>	4	ICAHN SCHOOL OF MEDICINE AT MOUN...	<a href="#">i</a>						114	68.9	7854
<input type="checkbox"/>	5	MASSACHUSETTS GENERAL HOSPITAL	<a href="#">i</a>						126	55.9	7046
<input type="checkbox"/>	6	CHILDREN'S HOSPITAL CORPORATION	<a href="#">i</a>						130	51.2	6656
<input type="checkbox"/>	7	UNIVERSITY OF CALIFORNIA LOS ANGE...	<a href="#">i</a>						131	50.7	6644
<input type="checkbox"/>	8	UNIVERSITY OF WASHINGTON	<a href="#">i</a>						105	61.4	6442
<input type="checkbox"/>	9	BRIGHAM AND WOMEN'S HOSPITAL	<a href="#">i</a>						119	52.0	6192
<input type="checkbox"/>	10	UNIVERSITY OF PITTSBURGH AT PITTSB...	<a href="#">i</a>						173	32.0	5532

# Researchers Need to Showcase their Impact

- **Give them 5 categories of metrics to tell their stories**
  - Not just the name of the journal where they published
  - Or a single count of citations
- **Tell the stories of research earlier**
  - Citation counts take 3-5 years to accrue
  - PlumX gives comprehensive metrics in the first year
- **Showcase more than just their journal articles**
  - Get credit for books and other research output

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mike@plumanalytics.com



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