New for Gold Delta SkyMiles® Credit Cardmembers: check your first bag for free on every Delta flight.
MY CARD CAN

EARN UP TO 25,000 BONUS MILES.
APPLY NOW
Offer subject to terms, conditions and restrictions. See MyCardCan.com for details.

Featured Today

Newsletters Bookmark

Mind Matters 12 hours ago
Food for Thought: Creating Edible Illusions--and Great Art
This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

News 9 hours ago
Exposing the Student Body: Stanford Joins U.C. Berkeley in Controversial Genetic Testing of Students

Scientific American Mind 10 hours ago
Skip the Small Talk: Meaningful Conversations Linked to Happier People

60-Second Science 19 hours ago
Design Boosts Chances For Air-Powered Motorcycle

Features 7/5/10
How Does Sewage Treatment Work?

Special Interactive Feature

The Dirty Truth about Plug-in Hybrids, Made Interactive
This Web-only article is a special rich-media presentation of the feature, "The Dirty Truth about Plug-in Hybrids," which appears in the July 2010 issue of *Scientific American*. The presentation was created by Zemi Media. Find all our other interactive offerings here.

Latest Stories

Reuters posted 3 hours ago
EPA proposes tougher air rules on power plants

Nature posted 4 hours ago
China outlines deep-sea ambitions

Scientific American Magazine posted 11 hours ago
Winged Victory: Modern Birds Now Found to Have Been Contemporaries of Dinosaurs

Nature posted 7/5/10
Few fishy facts found in climate report

Nature posted 7/5/10
Journals step up plagiarism policing

More >

Blogs & Opinion

Observations
Deflated expectations: It takes more than a gust to harness wind energy

Cross-check
Dubitable Darwin? Why Some Smart, Nonreligious People Doubt the Theory of Evolution

Expeditions
ICESCAPE scientists scan Arctic seas for melt ponds, "frazil," "grease" and "pancake"

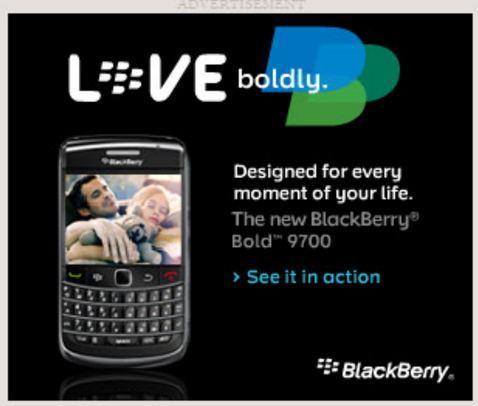
Observations
Quitting smoking during pregnancy may not be enough to prevent harm to baby

Observations
Study shows how sunlight on Titan yields life-precursor compounds

More >

Print Edition

- View Contents
- Risk-Free Trial
- Give A Gift

ADVERTISEMENT


Editor's Pick

In-Depth Reports 6/24/10
Personalized Medicine in the Genomic Era
When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Most Popular Stories

SCIENTIFIC AMERICAN

NEW NETWORKING RULE #3
NETWORKS SHOULD COST UP TO 65% LESS
Put the new rules of networking to work for you »
Outcomes that matter.
hp

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

EDIBLE AESTHETICS: Arcimboldo used clever arrangements of fruits, flowers, legumes and roots to create this likeness of Rodolfo II of Hapsburg, here depicted as Vertunno, the god of transformations.

E-MAIL
PRINT
COMMENT
Submit to digg
1 Thumbs-up
Stumble!

Ever been impressed with our modern world's ability to produce meals that look like one food but which are actually made of something else—like a tofu burger or artificial crab meat? It's actually an old trick. In medieval times fish was cooked to imitate venison during Lent, and celebratory banquets included a number of extravagant (and sometimes disturbing) delicacies such as meatballs made to resemble oranges, trout prepared to look like peas, and shellfish fashioned into mock viscera. Recipe books from the Middle Ages and the Renaissance also describe roasted chickens that appeared to sing, peacocks re-dressed in their own feathers and made to breathe fire, and an all-time favorite, a dish aptly named "Trojan Hog," in which a whole roasted pig was stuffed with an assortment of living creatures such as small birds, to the amusement and delight of cherished dinner guests. Unwelcome visitors were also treated to illusory food, but not quite as nice: They were served perfectly good meat that was made to look rotten and writhing with worms. Maybe not appetizing enough to eat, but repulsive enough to send your in-laws packing!

This month's slide show proves that illusory foods are alive and well. Our buffet of contemporary lip-smacking illusions will appeal to both your eyes and your stomach—for the most part. We hope you'll enjoy the spread.

Bon appétit!

View a slide show of food illusions

More to Explore

Slideshow
Food Illusions Slide Show

Subscription Center

- Risk-Free Issue
- Digital Subscriptions
- Give A Gift
- Customer Service

ADVERTISEMENT

Join the New Conversation in Science Education

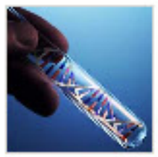
Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

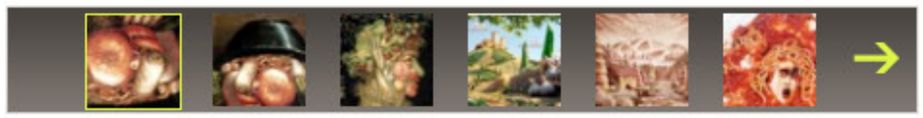
When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik



< Prev 1 of 9 Next >

"Vegetable Gardener" : Museo Civico Ala Ponzone, Cremona, Italy/ The Bridgeman Art Library CLICK TO ENLARGE +

An ordinary bowl of veggies

This still life by Italian painter Giuseppe Arcimboldo includes the ingredients for his favorite minestrone soup, and the bowl in which to serve it. But look again: there is something else hidden in the veggies. Turn to the next slide to find out.

< Prev 1 of 9 Next >

E-MAIL
COMMENT
Submit to digg
4 Thumbs-up
Stumble!

Subscription Center

- Risk-Free Issue
- Digital Subscriptions
- Give A Gift
- Customer Service

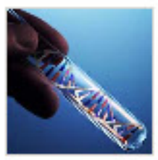
ADVERTISEMENT

Join the New Conversation in Science Education
Decade2 education SCIENTIFIC AMERICAN
Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter
Get weekly coverage delivered to your inbox
Enter your e-mail address SIGN UP NOW

Video

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

"Vegetable Gardener" : Museo Civico Ala Ponzone, Cremona, Italy/ The Bridgeman Art Library CLICK TO ENLARGE +

Same ordinary bowl of veggies--or is it?

Turned upside down, the bowl of vegetables from the previous slide becomes a whimsical portrait of a man's head, replete with bowler hat.

There are several interesting aspects to this illusion. First, why do we see a face in the arrangement when we know that it really is just a bunch of vegetables? The answer, as we explain in more detail in our previous Mind Matters article "Illusions: What's in a face?," is that our brains are hardwired to detect, recognize and discern facial features and expressions using only minimal data. This ability is critical to our interactions with other people and the reason that we perceive personality and emotion in everything from crude masks to the front ends of cars. Second, why do we see the face much more clearly when we flip the image vertically? The answer is that the same brain mechanisms that make face processing fast and effortless are optimized to process right-side-up faces, so upside-down faces are much harder to see and recognize.

Subscription Center

Risk-Free Issue
Digital Subscriptions
Give A Gift
Customer Service

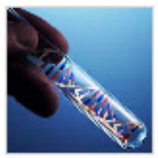
ADVERTISEMENT

Join the New Conversation in Science Education
Decade2 education SCIENTIFIC AMERICAN
Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick

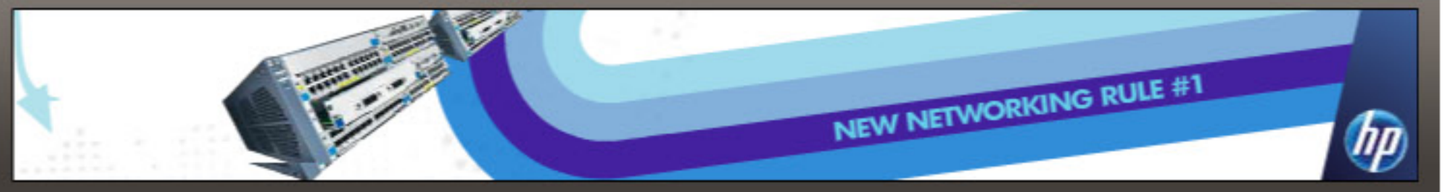


Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter
Get weekly coverage delivered to your inbox

Enter your e-mail address SIGN UP NOW



July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

< Prev 3 of 9 Next >

"Rudolf II" : Erich Lessing / Art Resource, NY; "Summer" : Kunsthistorisches Museum, Vienna, Austria/ The Bridgeman Art Library; "Autumn: Louvre, Paris, France/ Lauros / Giraudon/ The Bridgeman Art Library CLICK TO ENLARGE +

A lot to digest

Arcimboldo's composite heads demonstrate that, neuroscientifically speaking, the whole can be much more than the sum of the parts. Clever arrangements of individual fruits, flowers, legumes and roots become exquisite portraiture in their entirety, such as in the likeness of Rodolfo II of Hapsburg [*left*], here depicted as Vertunno, the god of transformations, or in the artist's self-portraits as Summer and Autumn [*middle and right*].

The brain builds representations of objects from individual features, like line segments and tiny patches of color. You detect an eyeball in the Summer portrait not because there is a retinal cell that perceives eyeballs but because the thousands of retinal photoreceptors that overlay the area of the painting that depicts an eye react to the various shades of color and luminance in such a way that high-level neuronal circuits later integrate the information and match it to the brain's template of an eye. The output from those same photoreceptors also activates the high-level object-tuned neurons that recognize turnips, figs and pickles, which makes images like these so fun to look at.

Last but not least, Arcimboldo's masterpieces also bring to mind the old adage that you are what you eat. So you should avoid fruits and nuts (at least, according to Jim Davis' Garfield the cat).

< Prev 3 of 9 Next >

E-MAIL
COMMENT
Submit to digg
Like it? Thumbs-up
Stumble!

Subscription Center

- Risk-Free Issue
- Digital Subscriptions
- Give A Gift
- Customer Service

ADVERTISEMENT

Join the New Conversation in Science Education

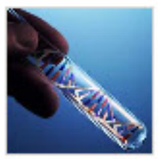
Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter

Get weekly coverage delivered to your inbox

Enter your e-mail address SIGN UP NOW

SCIENTIFIC AMERICAN

Join the New Conversation in Science Education

Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

< Prev 4 of 9 Next >

http://www.carlwarner.com CLICK TO ENLARGE +

E-MAIL
COMMENT
Submit to digg
1 Thumbs-up
Stumble!

Foodscapes

Art can be more than just a feast for your eyes. The images in the accompanying slide look, at first sight, like paintings of regular landscapes. But look closer: these are actual photographs of food stuffs laid out to re-create various types of scenery and terrains. London photographer Carl Warner arranges the meats and vegetables to create each environment as if in a Brothers Grimm fairy tale, and then photographs the scene in layers from foreground to background.

By using solely meats and breads in the bottom row images, for example, Warner captures the feel of old sepia postcards from the turn-of-the-century American prairie, complete with a breadstick log cabin, serrano ham skies and a prosciutto river. Please wait while we get something to eat.... Okay, we're back.

< Prev 4 of 9 Next >

Subscription Center

- Risk-Free Issue
- Digital Subscriptions
- Give A Gift
- Customer Service

ADVERTISEMENT

Join the New Conversation in Science Education

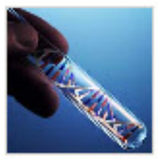
Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter

Get weekly coverage delivered to your inbox

Enter your e-mail address SIGN UP NOW

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

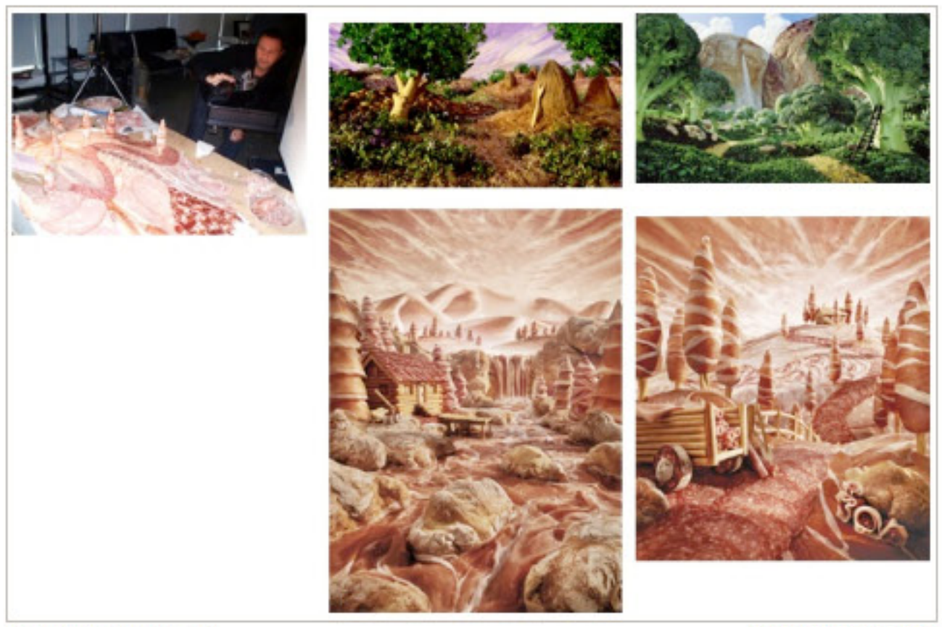
E-MAIL
COMMENT

Submit to digg

Like it? Thumbs-up

Stumble!

< Prev 5 of 9 Next >



http://www.carlwarner.com CLICK TO ENLARGE +

Foodscape 2

Here's another example of how the brain puts together information from multiple streams. Visual data from each point of the image is transduced from light to electrochemical signals in the retina, and then transmitted to the brain where individual features are constructed from the information in the image. Those discrete features are broadcast to multiple high-level visual circuits at once; circuits that recognize faces, circuits that detect and characterize motion, circuits for landscapes and places, and circuits for recognizing and processing food are just a few of the brain paths that receive this basic information. In Warner's art both the landscape/place and food-processing circuits are activated. (The other circuits receive the information but ignore it as irrelevant because there are no faces, motion, etcetera in the image.) And voilà! We see a delicious plate of cold cuts as well as an overcast sky from exactly the same data.

< Prev 5 of 9 Next >

Subscription Center

Risk-Free Issue
Digital Subscriptions
Give A Gift
Customer Service

ADVERTISEMENT

Join the New Conversation in Science Education

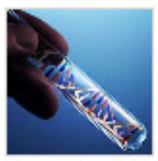
Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

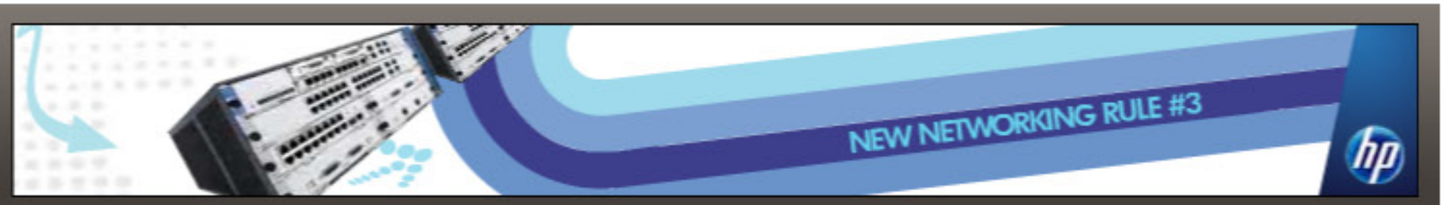
Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter



July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

E-MAIL
COMMENT
1 digg
1 Thumbs-up
Stumble!

< Prev 6 of 9 Next >

Art copyright Vik Muniz/Licensed by VAGA, New York, NY CLICK TO ENLARGE +

Medusa Marinara

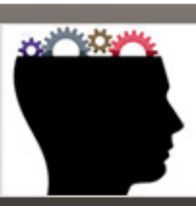
Brazilian-origin artist Vik Muniz also likes to play with his food. His "Medusa Marinara" is a visual pun on Caravaggio's Medusa, and it portrays an illusion of ambiguity that works at multiple levels. The red marinara sauce in Muniz's Medusa reminds the viewer of the blood sprouting from Medusa's severed neck in Caravaggio's version, and the spaghetti noodles around Medusa's head can be perceived as Caravaggio's Medusa's snakes-for-hair (an ambiguity illusion in and of itself).

< Prev 6 of 9 Next >

Subscription Center

- Risk-Free Issue
- Digital Subscriptions
- Give A Gift
- Customer Service

ADVERTISEMENT



Have a World Changing Idea?

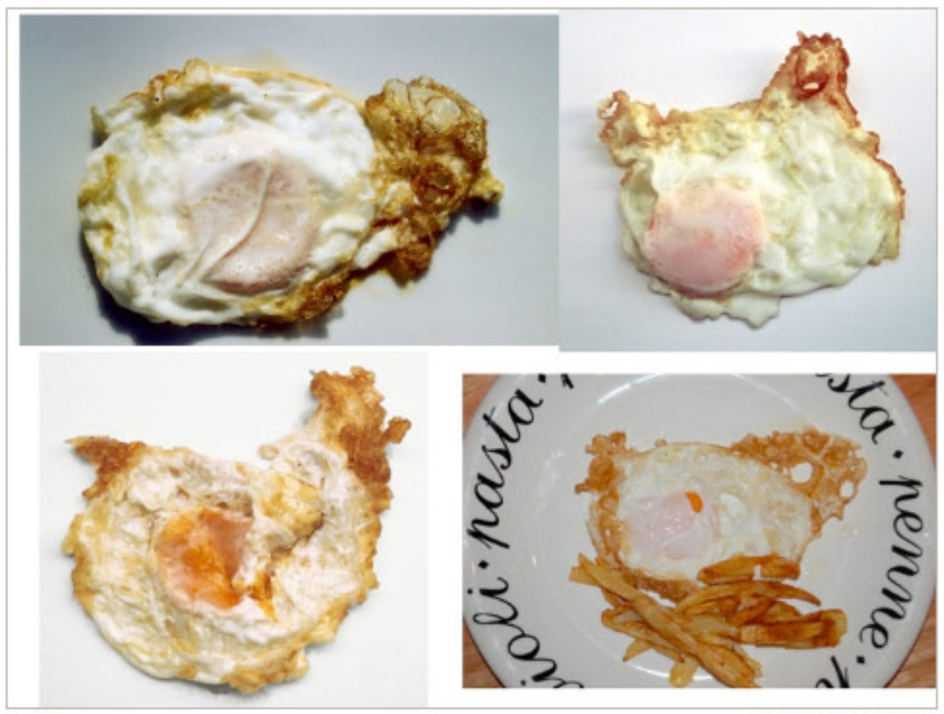
Scientific American is in search of science visionaries looking to build a better future.

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik



Din Matamoro CLICK TO ENLARGE +

Chicken and egg

Spanish artist Din Matamoro provides a unique perspective on developmental biology's most fundamental question: Which came first, the chicken or the egg? In Matamoro's fried eggs, ontogeny recapitulates phylogeny in an unusual and slightly unsettling fashion: the shape of each fried egg resembles the chicken that the egg would have become—or, perhaps, the hen that laid the egg in the first place.

Ambiguity illusions such as these recapitulate visual perception as a type of ontogeny in and of itself. Objects, in this case chickens, are built in the henhouses of our minds from nuggets of visual information sent from the retina. These little visual giblets activate circuits that process animal shapes (birds, in this case) as well as circuits that process food data. This kind of multichannel processing is at the heart of all ambiguity: The neural basis of ambiguous perception is two or more brain circuits that compete for dominance in our awareness.

Subscription Center

Risk-Free Issue
Digital Subscriptions
Give A Gift
Customer Service

ADVERTISEMENT

SCIENTIFIC AMERICAN PRESENTS THE WORLD CHANGING IDEAS VIDEO CONTEST

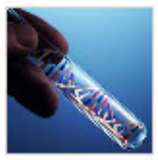
Have a World Changing Idea?

Scientific American is in search of science visionaries looking to build a better future.

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter

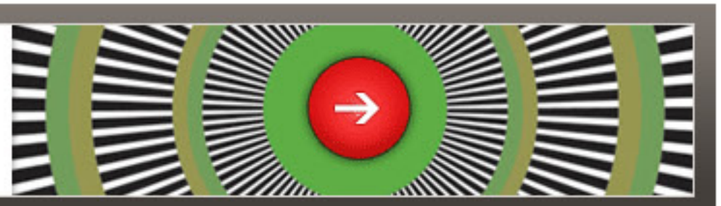
Get weekly coverage delivered to your inbox

Enter your e-mail address SIGN UP NOW

SCIENTIFIC AMERICAN

From the editors of SCIENTIFIC AMERICAN MIND

169 Best Illusions
You Won't Believe Your Eyes
GET THIS SPECIAL ISSUE NOW



Register/Login | Online Sections | Blogs | Scientific American Magazine | Scientific American Mind | Science Jobs | Subscribe

Basic Science • Space • Evolution • Energy & Sustainability • Mind & Brain • Health & Medicine • Technology

Search the Site

July 6, 2010 | 3 comments

Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

< Prev 8 of 9 Next >

Jelly Belly Candy Co. CLICK TO ENLARGE +

Edible pointillism

Pointillist painters such as Seurat and Signac juxtaposed multiple individual points to create color blends that were very different from the colors in the original dots. But in a very real sense, all art is pointillism. In fact, all visual perception is pointillism. Our retinas are sheets of photoreceptors, each sampling a finite circular area of visual space. Each photoreceptor then connects to downstream neural circuits that build our perception of objects, faces, loved ones and everything else. Thus, vision itself is largely a pointillist illusion, colored by a huge amount of guesstimation and filling in on the part of our brains. It doesn't matter that the painter uses brushstrokes versus fields of dots to define surfaces.

The dots that compose the accompanying images are multicolored jelly beans, which is clever—and delicious. Eat your heart out, Seurat.

< Prev 8 of 9 Next >

E-MAIL
COMMENT
Submit to digg
Like it? Thumbs-up
Stumble!

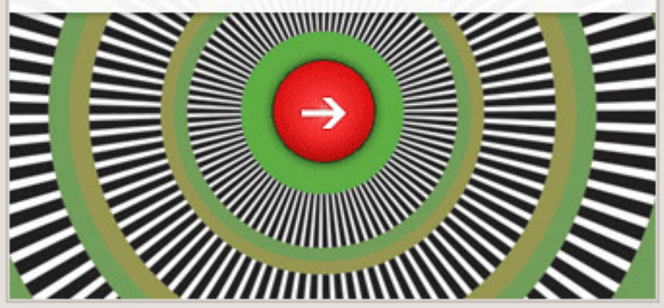
Subscription Center

Risk-Free Issue
Digital Subscriptions
Give A Gift
Customer Service

ADVERTISEMENT

From the editors of SCIENTIFIC AMERICAN MIND

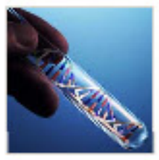
169 Best Illusions
You Won't Believe Your Eyes
GET THIS SPECIAL ISSUE NOW



World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease have proved more complex

Mind & Brain Newsletter
Get weekly coverage delivered to your inbox
Enter your e-mail address SIGN UP NOW

SCIENTIFIC AMERICAN

Join the New Conversation in Science Education

Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

July 6, 2010 | 3 comments

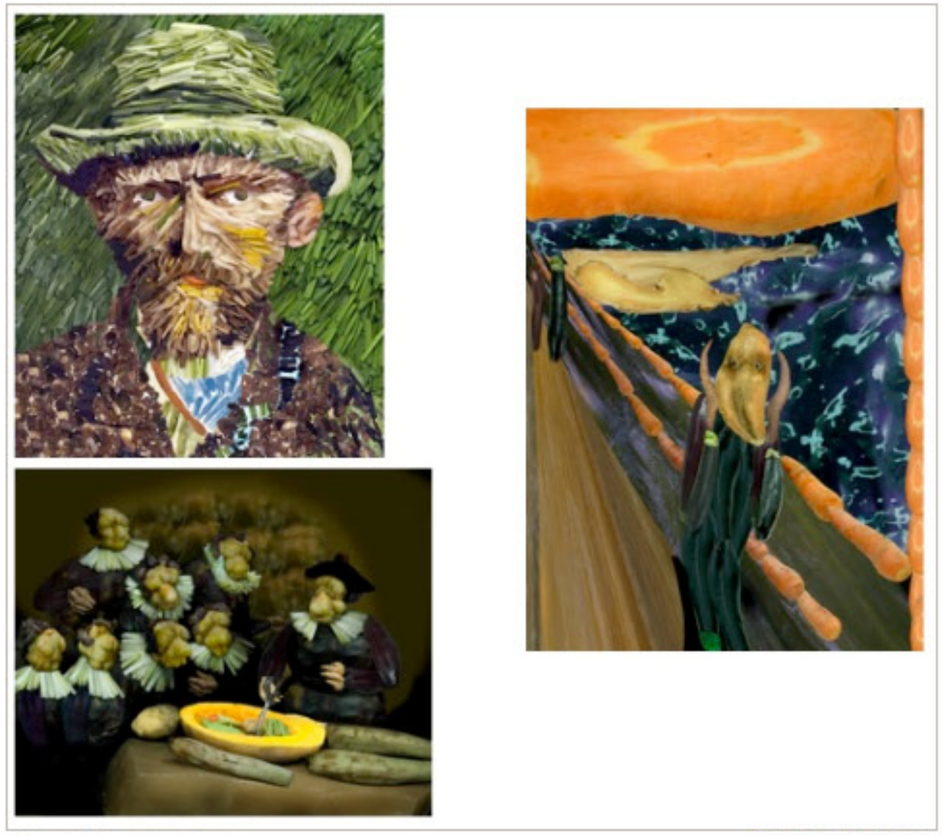
Food for Thought: Creating Edible Illusions--and Great Art [Slide Show]

This is the 10th article in the Mind Matters series on the neuroscience behind visual illusions.

By Susana Martinez-Conde and Stephen L. Macknik

E-MAIL
COMMENT
Submit to digg
Like it? Thumbs-up Stumble!

< Prev 9 of 9 Next >



Ju Duoqi/Galerie Paris-Beijing CLICK TO ENLARGE +

Mouthwatering masterpieces

If you agree that jelly-bean pointillism is a great idea, you'll also be sure to appreciate these replicas of famous masterpieces. Everything in the accompanying images is fit for human consumption.

< Prev 9 of 9 Next >

Subscription Center

- Risk-Free Issue
- Digital Subscriptions
- Give A Gift
- Customer Service

ADVERTISEMENT

Join the New Conversation in Science Education

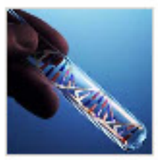
Decade2 education SCIENTIFIC AMERICAN

Click here for a multimedia discussion with experts

World Changing Ideas Video Contest

Innovation is the key to a better future. Enter your own World Changing Ideas videos in our contest. For examples, see "World Changing Ideas," *Scientific American*; December 2009.

Editor's Pick



Personalized Medicine in the Genomic Era

When the human genome draft was announced 10 years ago, many researchers and policymakers anticipated using the newly sequenced code to develop a wealth of diagnostic and treatment capabilities. But the genetic components of disease