

# INFORMATIONAL POSTERS & GRAPHICS

## 1ST PLACE

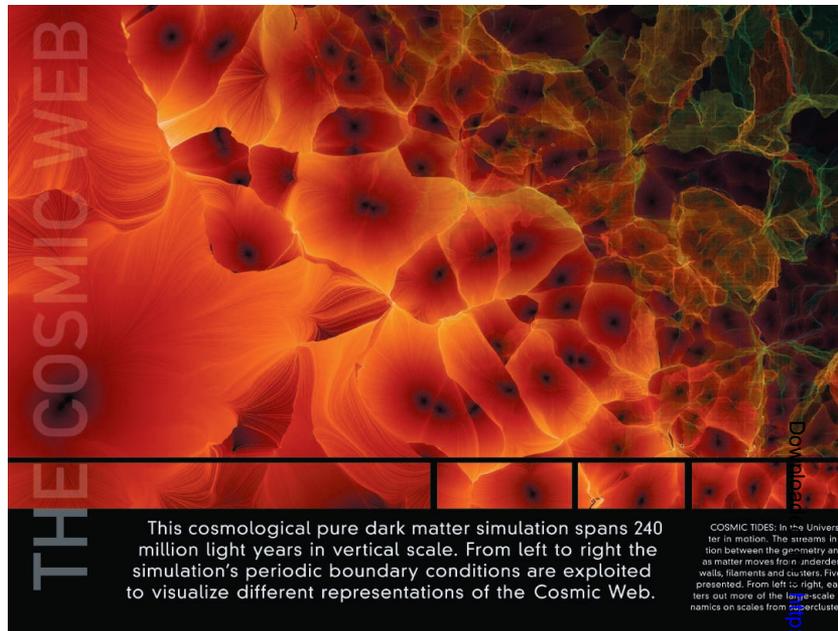
### The Cosmic Web

Miguel Angel Aragon-Calvo, Julieta Aguilera, Mark Subbarao  
Johns Hopkins University

A spider's web catches flies. But the cosmic web depicted in the winning poster snares galaxies. Cosmologist Miguel Angel Aragon-Calvo of Johns Hopkins University in Baltimore, Maryland, and colleagues illustrate how an invisible network of matter creates space's familiar features: "This poster is [intended] to show the relationship between galaxies and the environment where they live," he says.

Galaxies don't grow out of nothing, Aragon-Calvo notes. Instead, their formation is decided by underlying but invisible accumulations of dark matter. Scientists suspect that this substance, which is still theoretical and remains impossible to observe, gives rise to most of the gravity in the universe. That gravity becomes the glue that holds galaxies together. So, in regions where dark matter is dense, galaxies begin to form, often grouping together in clusters or long walls.

In their poster, which from top to bottom represents about 240 million light-years, Aragon-Calvo and colleagues simulate that process. They explore the same patch of space from five different vantage points, traveling from the invisible to the visible. As the universe expands following the big bang, strings of dark matter condense along the edges of voids nearly tens of millions of light-years wide. These mostly empty regions of space can be seen at the far left of the poster (dark orange) bordered by bright filaments rich in matter. In the middle, weeping willow-like arcs follow the flow of matter over



This cosmological pure dark matter simulation spans 240 million light years in vertical scale. From left to right the simulation's periodic boundary conditions are exploited to visualize different representations of the Cosmic Web.

COSMIC TIDES: In the Universe in motion, the streams in which matter moves from underdense voids, filaments and clusters. Five different representations of the Cosmic Web are presented. From left to right, each panel shows a different scale of the large-scale structure dynamics on scales from superclusters

time. The lines converge at the present day, shown in red, and eventually spawn bright galaxies at the same points (far right). Depicting the entire "history of matter" in one poster is an ambitious task, but Aragon-Calvo hopes that viewers will come away with one message: "The universe has a rich structure." Just like a spider web.

This brightly colored illustration with accompanying text is "aesthetically beautiful," says challenge judge Corinne Sandone. And "I think it's fabulous that we can see some of the structure and to see it visualized as you move further and further into space."

## HONORABLE MENTION

### The Ebola Virus

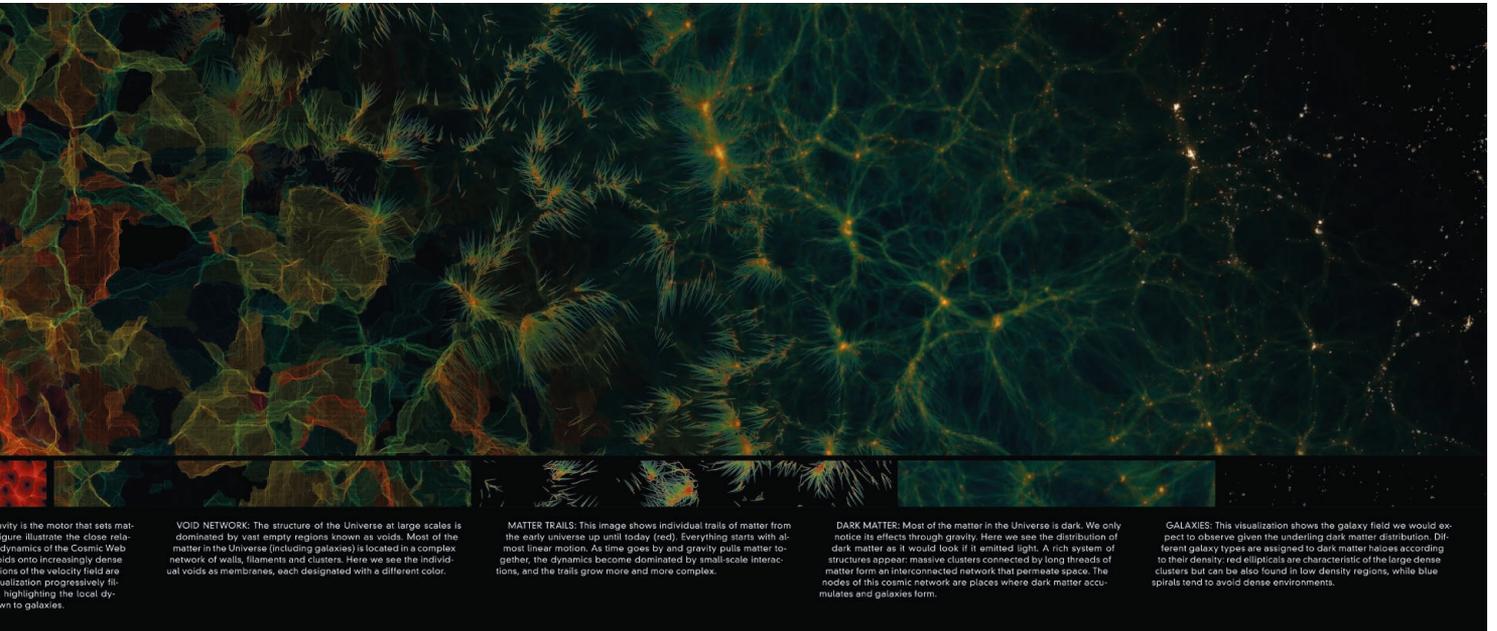
Ivan Konstantinov, Yury Stefanov,  
Alexander Kovalevsky, Anastasya Bakulina  
Visual Science

based group Visual Science. His team drew on existing scientific information to depict the 3D structure of the Ebola virus, responsible for fatal outbreaks of hemorrhagic fever throughout much of Africa.

This virus, only 1400 nanometers in length, is no simple pathogen, Konstantinov says. His group previ-

ously patched together a similar 3D model of HIV. But Ebola is nearly 10 times larger, containing roughly 3 million lipids and protein molecules. The poster, too, provides a good look at how Ebola turns dangerous. Proteins coded by the virus's own genome are shown here in maroon. They're the pathogen's Velcro, clinging to the surface of target cells and giving the virus access to their interior. Anyone perusing this poster "can clearly understand that the Ebola virion is a very complex supra-

molecular structure, with various polypeptides, lipids, and RNA genome included," Konstantinov says. Not exactly the stuff of an Ansel Adams photograph, but an eye-catching sight nevertheless.



...vity is the motor that sets mat-  
...ure illustrate the close rela-  
...dynamics of the Cosmic Web  
...ids onto increasingly dense  
...ions of the velocity field are  
...utilization progressively fil-  
...highlighting the local dyn-  
...to galaxies.

**VOID NETWORK:** The structure of the Universe at large scales is dominated by vast empty regions known as voids. Most of the matter in the Universe (including galaxies) is located in a complex network of walls, filaments and clusters. Here we see the individual voids as membranes, each designated with a different color.

**MATTER TRAILS:** This image shows individual trails of matter from the early universe up until today (red). Everything starts with almost linear motion. As time goes by and gravity pulls matter together, the dynamics become dominated by small-scale interactions, and the trails grow more and more complex.

**DARK MATTER:** Most of the matter in the Universe is dark. We only notice its effects through gravity. Here we see the distribution of dark matter as it would look if it emitted light. A rich system of structures appear: massive clusters connected by long threads of matter form an interconnected network that permeate space. The nodes of this cosmic network are places where dark matter accumulates and galaxies form.

**GALAXIES:** This visualization shows the galaxy field we would expect to observe given the underlying dark matter distribution. Different galaxy types are assigned to dark matter haloes according to their density: red ellipsoids are characteristic of the large dense clusters but can be also found in low density regions, while blue spirals tend to avoid dense environments.

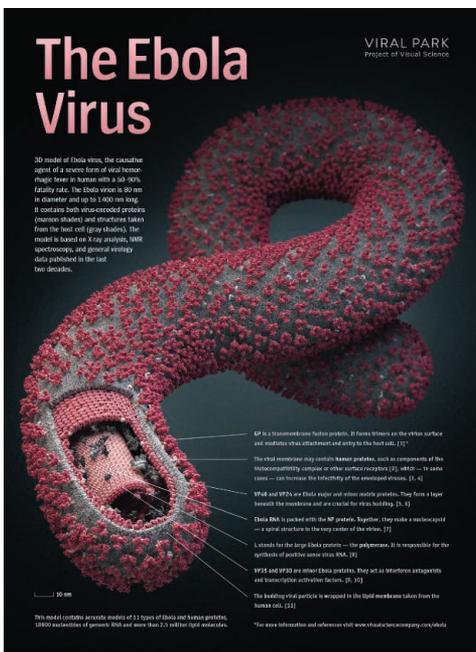
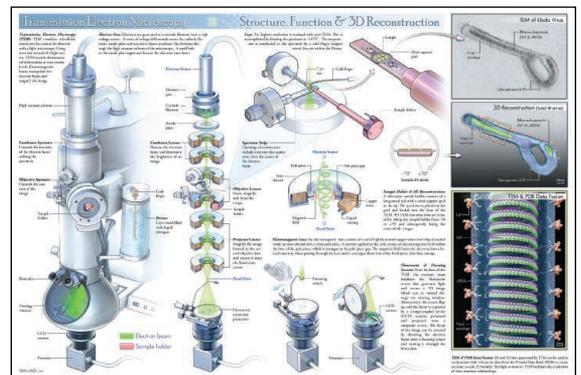
**PEOPLE'S CHOICE**  
**Transmission Electron Microscopy:**  
**Structure, Function & 3D Reconstruction**

Fabian de Kok-Mercado, Victoria Wahl-Jensen, and Laura Bollinger  
NIAID IRF

For anyone who's ever wanted to take apart a microscope to see how it works, this is the poster for you. Here, scientists at the National Institute of Allergy and Infectious Diseases Integrated Research Facility (IRF) in Fred-

erick, Maryland, dismantle a transmission electron microscope (TEM) piece by piece—all without damaging expensive lab equipment. These instruments bombard tiny objects such as viruses or proteins with beams of electrons, capturing images too small for conventional light microscopes.

In their dissection, Fabian de Kok-Mercado and colleagues at IRF delve into deeper and deeper detail, moving from left to right. The researchers first display a TEM in its entirety. Then they follow the visualization tool down to its cryo-device (at right), which keeps organic samples cool for maximum clarity. In between, viewers themselves can track the formation of an electron beam from start to finish. It begins at the electron gun that creates the free particles using an electric current, then continues through a handful of lenses that condense, focus, and magnify the output. It's the ideal schematic for technology junkies who like to think small.



**The Ebola Virus**

3D model of Ebola virus, the causative agent of a severe form of viral hemorrhagic fever in humans with a 50-90% fatality rate. The Ebola virus is 800 nm in diameter and up to 1,400 nm long. It contains both virus-encoded proteins (protein shells) and structural proteins from the host cell (gray shades). The model is based on X-ray analyses, NMR spectroscopy, and general genomic data published in the last two decades.

GP 1 is transmembrane fusion protein. It forms spikes on the virion surface and mediates the attachment and entry to the host cell. [1]  
The viral envelope may contain surface proteins, such as components of the immunocompatibility complex or other surface receptors [2], which... to cause...  
VP40 and VP24 are Ebola major and minor matrix proteins. The VP40 is located towards the membrane and are crucial for virus budding. [3, 4]  
Ebola RNA is packed with the NP proteins. Together, they make a nucleocapsid... a spiral structure in the very center of the virion. [5]  
VP30 is the large Ebola protein - the polymerase. It is responsible for the synthesis of proteins and the RNA. [6]  
VP24 and VP24 are minor Ebola proteins. They act as interferon antagonists and transcription activation factors. [7, 8]  
The budding viral particle is wrapped in the lipid membrane taken from the human cell. [9]

\*For more information and references visit [www.virusatciencia.com/ebola](http://www.virusatciencia.com/ebola)

# Science

## Informational Posters & Graphics

*Science* **335** (6068), 530-531.  
DOI: 10.1126/science.335.6068.530

ARTICLE TOOLS	<a href="http://science.sciencemag.org/content/335/6068/530">http://science.sciencemag.org/content/335/6068/530</a>
RELATED CONTENT	<a href="http://science.sciencemag.org/content/sci/335/6068/525.full">http://science.sciencemag.org/content/sci/335/6068/525.full</a>
PERMISSIONS	<a href="http://www.sciencemag.org/help/reprints-and-permissions">http://www.sciencemag.org/help/reprints-and-permissions</a>

Use of this article is subject to the [Terms of Service](#)

---

*Science* (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title *Science* is a registered trademark of AAAS.

Copyright © 2012, American Association for the Advancement of Science