

2015

Stereology & Image Analysis

July 6–10, 2015
Liege, Belgium
www.14icsia.com

Semicon West, 2015

July 14–16, 2015
San Francisco, CA
www.semiconwest2015.org

Microscopy & Microanalysis 2015

August 2–6, 2015
Portland, OR
www.microscopy.org

31st European Conference on Surface Science (ECOSS-31)

August 31–September 4, 2015
Barcelona, Spain
www.ecoss2015.org

SMMS 2015: Single-Molecule Microscopy and Spectroscopy

September 14–16, 2015
London, UK
www.rsc.org/conferencesandevents/rsconferences/fd/molecule-fd2015/index.asp

SPIE Scanning Microscopies

September 29–October 1, 2015
Monterey, CA
http://spie.org/x104030.xml

Materials Science & Technology 2015

October 4–8, 2015
Columbus OH
http://matscitech.org

Neuroscience 2015

October 17–21, 2015
Chicago, IL
Sponsor: Society for Neuroscience
www.sfn.org

2015 MRS Fall Meeting & Exhibition

November 29–December 4, 2015
Boston, MA
Sponsor: Materials Research Society (MRS)
www.mrs.org/fall2015

American Society for Cell Biology (ASCB) 2015 Annual Meeting

December 12–16, 2015
San Diego, CA
http://ascb.org/future-ascb-annual-meetings

2016

Microscopy & Microanalysis 2016

July 24–28, 2016
Columbus, OH
www.microscopy.org

2017

Microscopy & Microanalysis 2017

July 23–27, 2017
St. Louis, MO
www.microscopy.org

2018

Microscopy & Microanalysis 2018

August 5–9, 2018
Baltimore, MD
www.microscopy.org

2019

Microscopy & Microanalysis 2019

August 4–8, 2019
Portland, OR
www.microscopy.org

More Meetings and Courses

Check the complete calendar near the back of this magazine.

Carmichael's Concise Review

Visualizing a Molecular Motor

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Dynactin works with the cytoplasmic dynein-1 motor (dynein) to transport cargo along the microtubule-based skeleton of cells. Together, these protein complexes maintain the spatial organization of the cell, return components from the periphery of the cell, and assist with cellular division. Although much is known about dynactin and dynein, a number of questions remain. For example, how does dynein bind to dynactin, and why does the interaction require the cargo adaptor Bicaudal-D2 (BICD2)? To address this and related questions, a team in the U.K. led by Linas Urnavicius, Kai Zhang, Aristides Diamant, and Andrew Carter [1] took advantage of recent advances in cryo-electron microscopy (cryo-EM) to improve the understanding of the structure of dynactin.

For a number of technical reasons, dynactin is a challenging target for cryo-EM. Urnavicius et al. overcame the hurdles by making cryo-EM maps at resolutions between 6.5 Å and 3.5 Å and used these maps to build a model of dynactin. The dynactin filament is nine subunits long and consists of two protofilaments that wrap around each other. The presence of β-actin in the filament was controversial. The cryo-EM map that they constructed was of sufficient quality to show that one

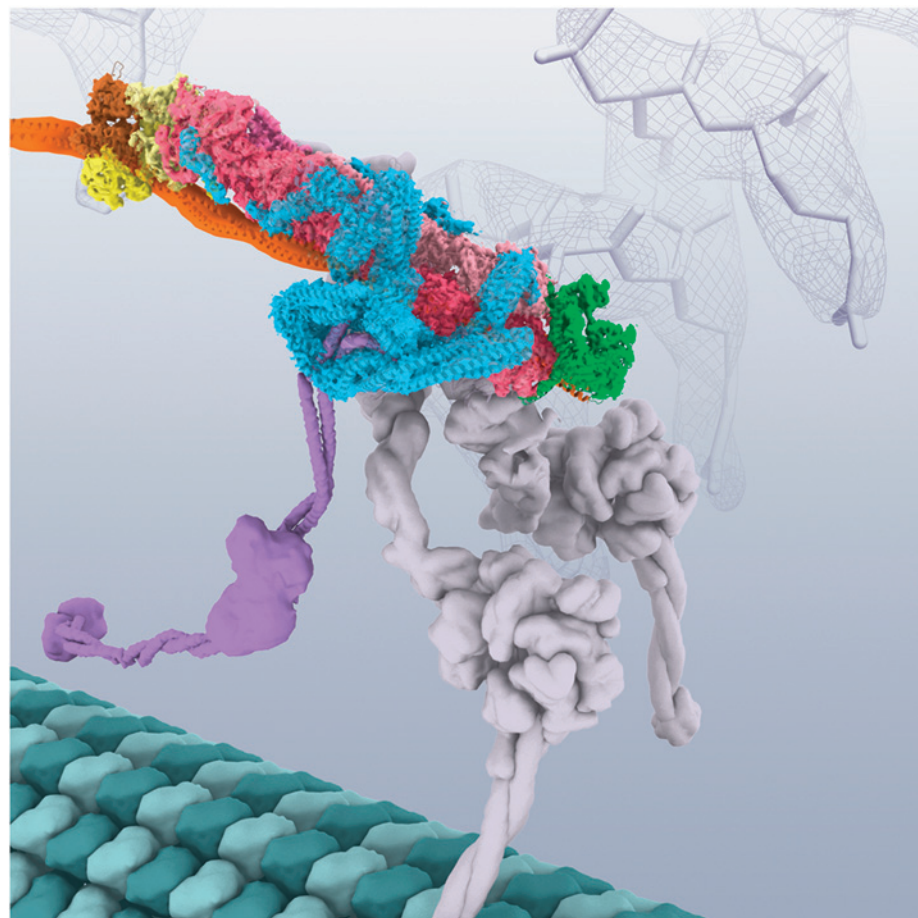
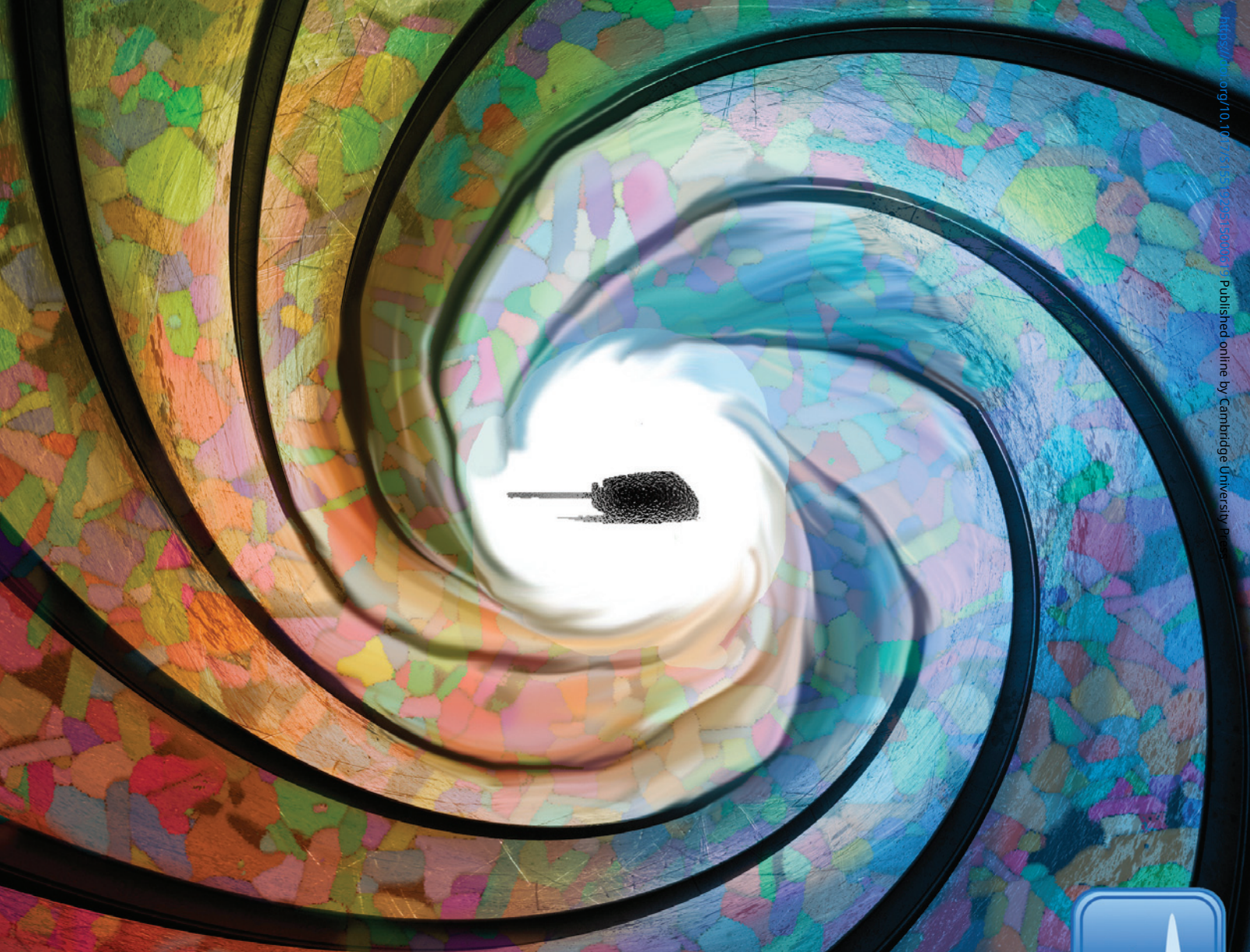


Figure 1: Model of the structure of cytoplasmic dynein (gray) bound to dynactin (multicolor) via the Golgi vesicle cargo adaptor BICD2 (orange) constructed from cryo-EM maps.

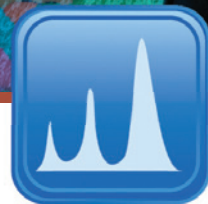


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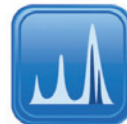
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of the subunits is β -actin; whereas the other subunits are Arp1, a protein related to actin. The presence of Arp1 and β -actin at an 8:1 ratio was confirmed by mass spectrometry-based quantitative proteomic analysis.

There are many other details of the study by Urnavicius et al. that lead to a novel hypothesis as to how the recruitment of dynactin by a cargo adaptor activates dynein. Previous studies with artificially dimerized dynein motor domains suggested that they self-associate in an auto-inhibited conformation unless they are separated. Urnavicius et al. suggested that dynactin activates the motor domains by reorienting two copies of the dynein heavy chain (DHC). Both DHC N termini are anchored parallel to each other, but the C termini are forced to twist apart because only one chain binds the second site on dynactin. This hypothesis explains why dynactin is built around an actin-like filament. The translational symmetry of the filament matches that of the DHC N termini, whereas the filament length provides additional binding sites that force dynein to adopt its active conformation. And that may be how a molecular motor works!

References

- [1] L Urnavicius et al., *Science* 347 (2015) 1441–46.
- [2] The author gratefully acknowledges Dr. Andrew Carter for reviewing this article.

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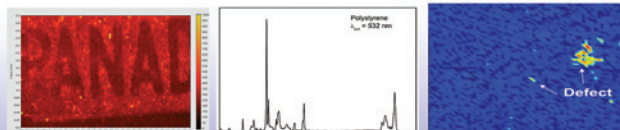
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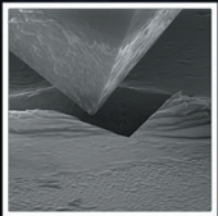
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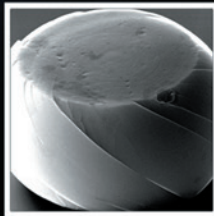
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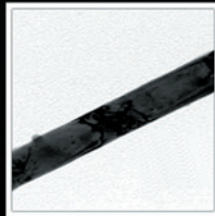
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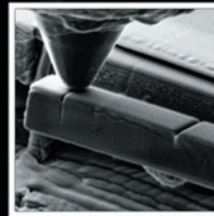
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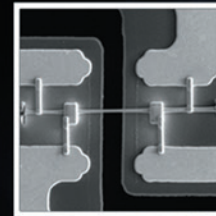
Compression



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Bend

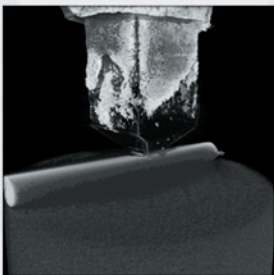


Electrical



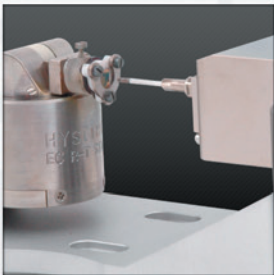
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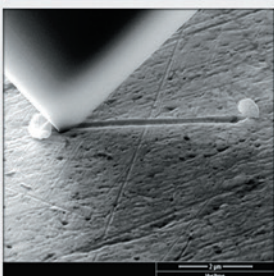
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