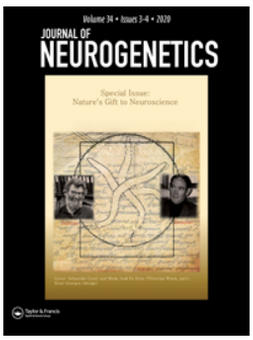

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GALLERY

A journey to 'tame a small metazoan organism', ‡ seen through the artistic eyes of *C. elegans* researchers

Eleni Gourgou[a], Alexandra R. Willis[b], Sebastian Giunti[c], Maria J. De Rosa[c], Amanda G. Charlesworth[b], Mirella Hernandez Lima[a], Elizabeth Glater[d], Sonja Soo[e], Bianca Pereira[f], Kübra Akbaş[g], Anushka Deb[h], Madhushree Kamak[h], Mark W. Moyle[i], Annika Traa[e], Aakanksha Singhvi[j], Surojit Sural[a]† and Eugene Jennifer Jin[k]

[a]Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI, USA; [b]Department of Molecular Genetics, University of Toronto, Toronto, ON, Canada; [c]Instituto de Investigaciones Bioquímicas Bahía Blanca-INIBIBB, Bahía Blanca, Argentina; [d]Pomona College, Claremont, CA, USA; [e]Department of Neurology and Neurosurgery, McGill University, Montreal, QC, Canada; [f]Department of Biological Sciences, Wayne State University, Detroit, MI, USA; [g]New Jersey Institute of Technology, Newark, NJ, USA; [h]Tata Institute of Fundamental Research-TIFR, Mumbai, India; [i]School of Medicine, Yale University, New Haven, CT, USA; [j]Fred Hutchinson Cancer Research Center, Seattle, WA, USA; [k]Neurobiology Section, Division of Biological Sciences, University of California, San Diego, La Jolla, CA, USA

ABSTRACT

In the following pages, we share a collection of photos, drawings, and mixed-media creations, most of them especially made for this JoN issue, manifesting *C. elegans* researchers' affection for their model organism and the founders of the field. This is a celebration of our community's growth, flourish, spread, and bright future. Descriptions provided by the contributors, edited for space.[1]

ARTICLE HISTORY
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CONTACT Eleni Gourgou egourgou@umich.edu

‡From S. Brenner's letter to Max Perutz, 1963, where he made the case for introducing *C. elegans* as a model system and explained his vision about biology's big questions of the time.

†Current affiliation: Columbia University, USA

[1]See page 11 for a complete list of authors and credits.

Figure 1. S. Brenner, J. Sulston, and colleagues. J. Sulston's FRS celebration party, MRC coffee room, 1986. Individuals are named from left to right. (A) J. Sulston and S. Brenner; (B) J. Sulston, Alan Coulson, S. Brenner; (C) Peter Lawrence, J. Sulston, Alan Coulson, S. Brenner; (D) Jim Priess, Peter Lawrence, Jonathan Hodgkin, J. Sulston; (E) Richard Durbin, Maria Leptin, Nichol Thomson, Jim Priess, Peter Lawrence; (F) Cynthia Kenyon, Michael Shen.

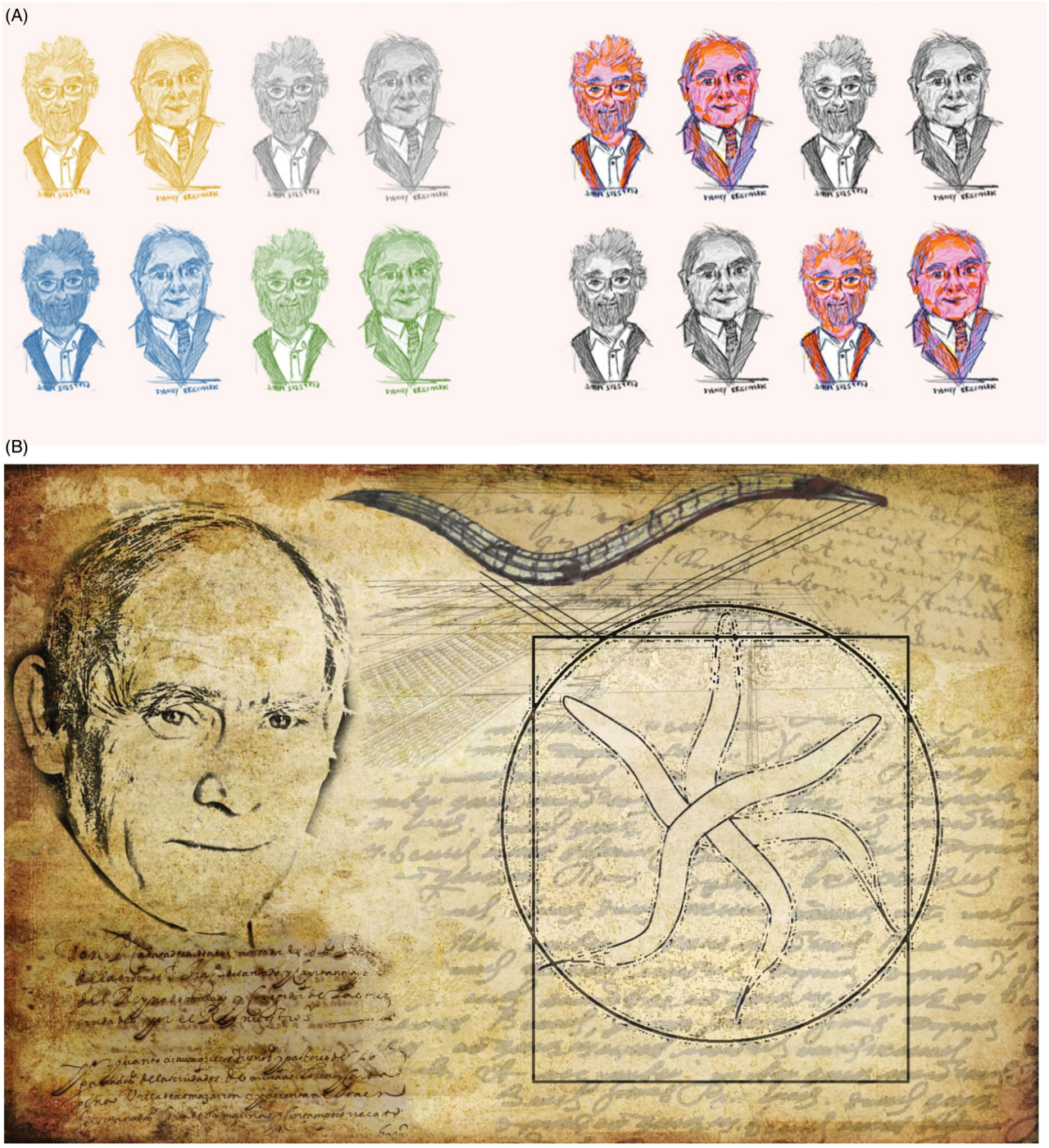

Figure 2. S. Brenner and J. Sulston, as artistic inspiration. (A) J. Sulston and S. Brenner; drawing; (B) Vitruvian Worm; drawing, mixed media.

Figure 3. 'When you blow bubbles in the wind you never know where they will go. When Sydney Brenner started us down the incredible path of researching *C. elegans* he could never have imagined how much they would teach us all. Represented here are only a fraction of some of the amazing things we have learned from Worms', drawing.

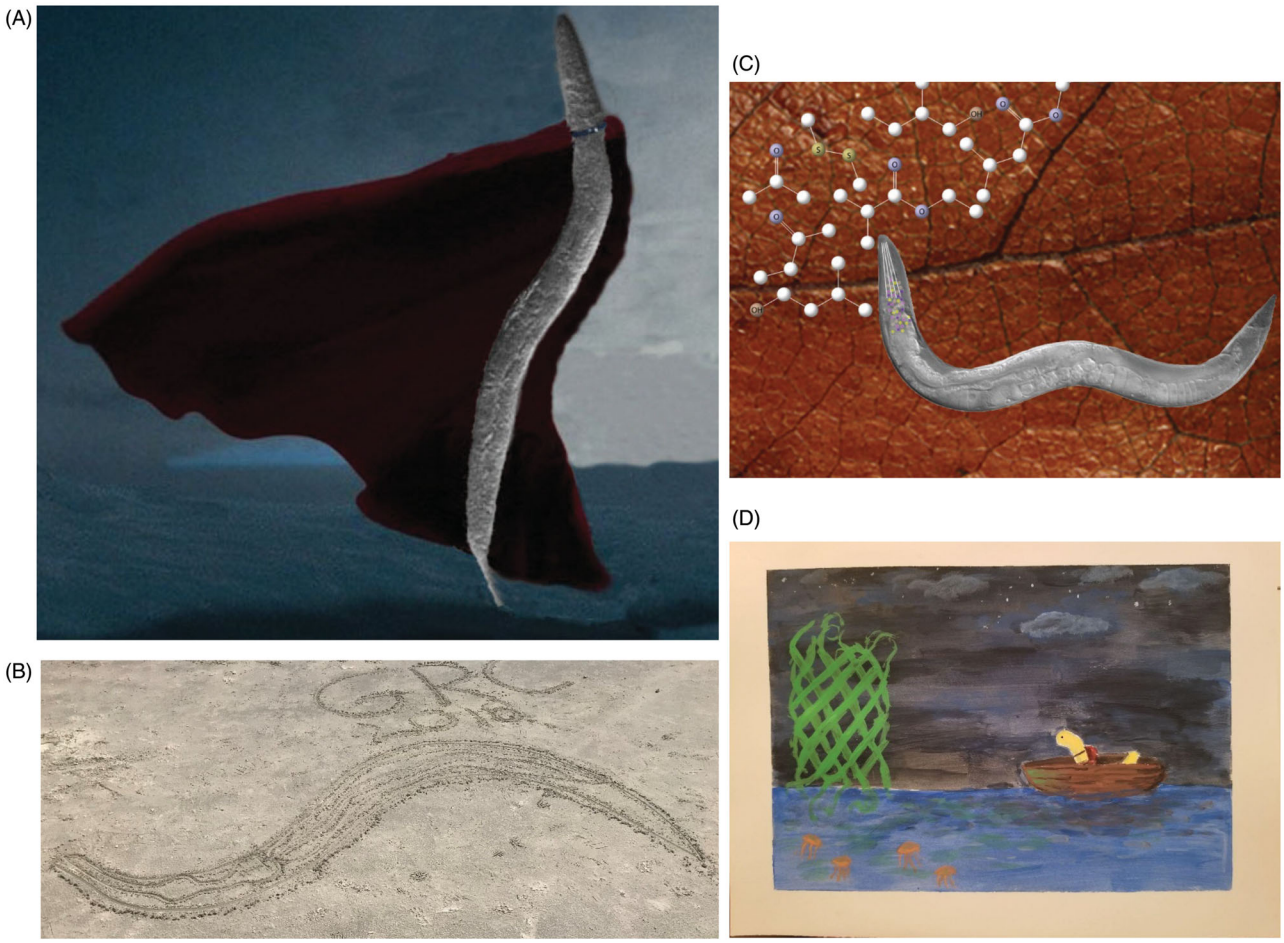

Figure 4. Just a few of *C. elegans*' many adventures. (A) '*Caenorhabditis elegans*, a transparent mystical nematode that has provided insight into the mysteries of science, exposing truths that transcend human understanding'. (B) A worm drawn in the sand, March 2018 Sleep Gordon Research Conference, Galveston, Texas, USA. (C) '*C. elegans* uses chemosensation to distinguish among different species of bacteria, their major food source. Work from the Glater lab and others have identified volatile organic compounds that *C. elegans* uses to recognize and detect different bacterial species', mixed media; (D) 'Journey of the elegant glow', acrylic on paper: 'As the first model organism to express Green Fluorescent Protein (GFP), *C. elegans* provide a powerful tool for scientific discoveries'.

Figure 5. *C. elegans* in graphic novels. (A) The Nictation Chronicles, comic strip. (B) How an engineer-roboticist envisions *C. elegans*. Left: Star-gazing glowing worm: a metaphorical representation of how *C. elegans* can be considered a building block in the universe due to its use as a model organism in many biological studies, especially those pertaining to biomedical applications. Right: Notes on a worm-inspired soft robot: a mechanical and robotic approach to *C. elegans*, where the inspiration for a potential pneumatically-actuated soft robot is outlined. (C) The Adventures of the Wormlock Holmes-A scandal in Neuroglia. (D) Captain Elegans.

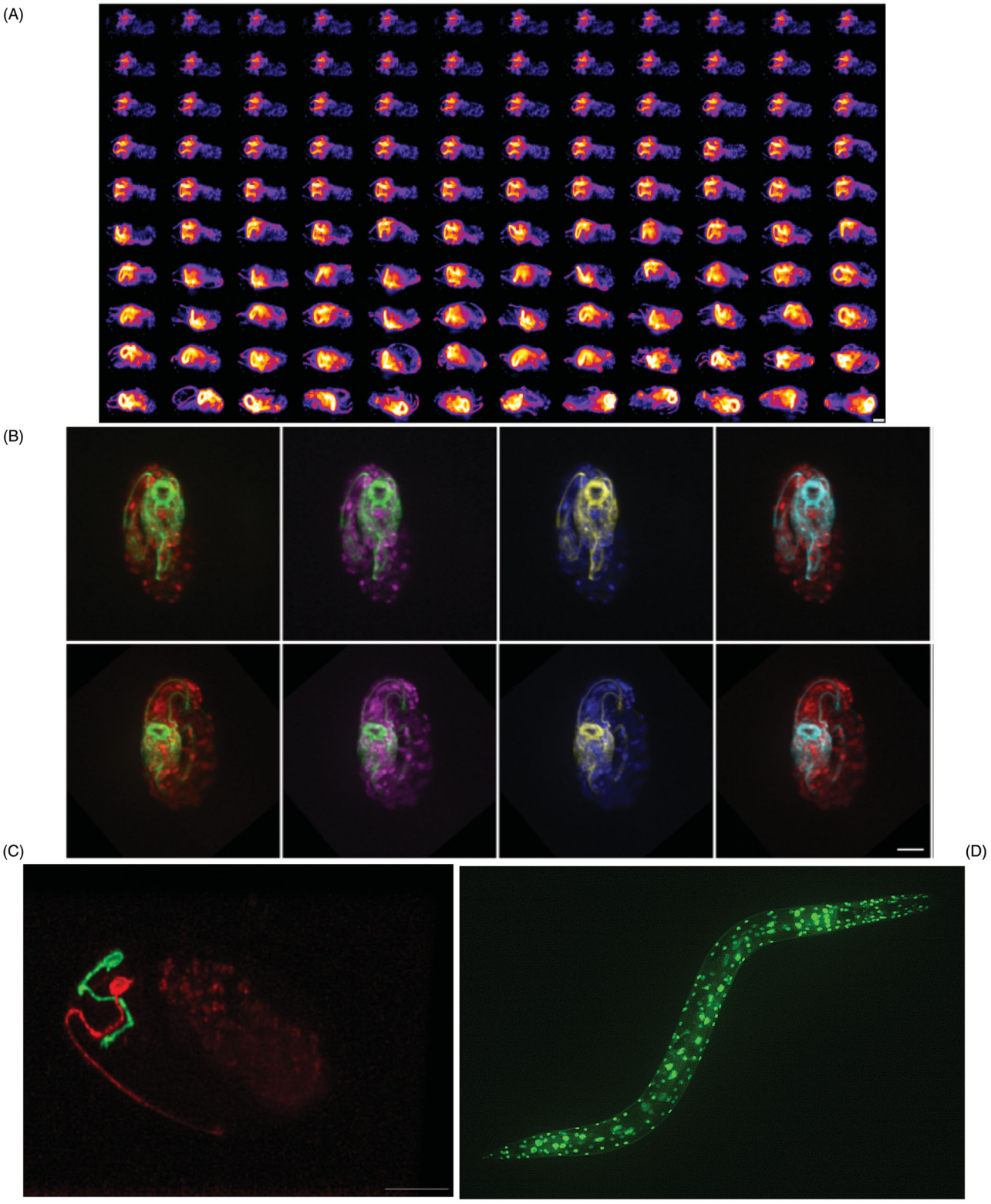

Figure 6. *C. elegans* microscopy, Part I. (A) Two-hour time-lapse sequence of the developing *C. elegans* nervous system, *rab-3p::membrane tethered GFP* transgene. The bright, omega-like structure (Ω) is the nerve ring neuropil (the *C. elegans* brain). (B) *C. elegans* neurodevelopment. *rgef-1p::membrane tethered GFP* transgene. Nuclei were simultaneously imaged by using *mCherry::histone* transgene. Circular ring structure corresponds to the nerve ring neuropil of the animal. (C) Developing neurons in *C. elegans* embryo, *hlh-16p::membrane tethered GFP* transgene. Both neurites are in close proximity at the nerve ring neuropil. Neurons have been pseudocolored red and green with Photoshop to highlight individual outgrowth dynamics. (D) Nuclear localization of DAF-16::GFP. This image depicts a DAF-16::GFP reporter strain, which is used to monitor the nuclear localization of DAF-16, after having been exposed to a 37 °C heat stress for four hours. (Color images available in the electronic version of this photo gallery.)

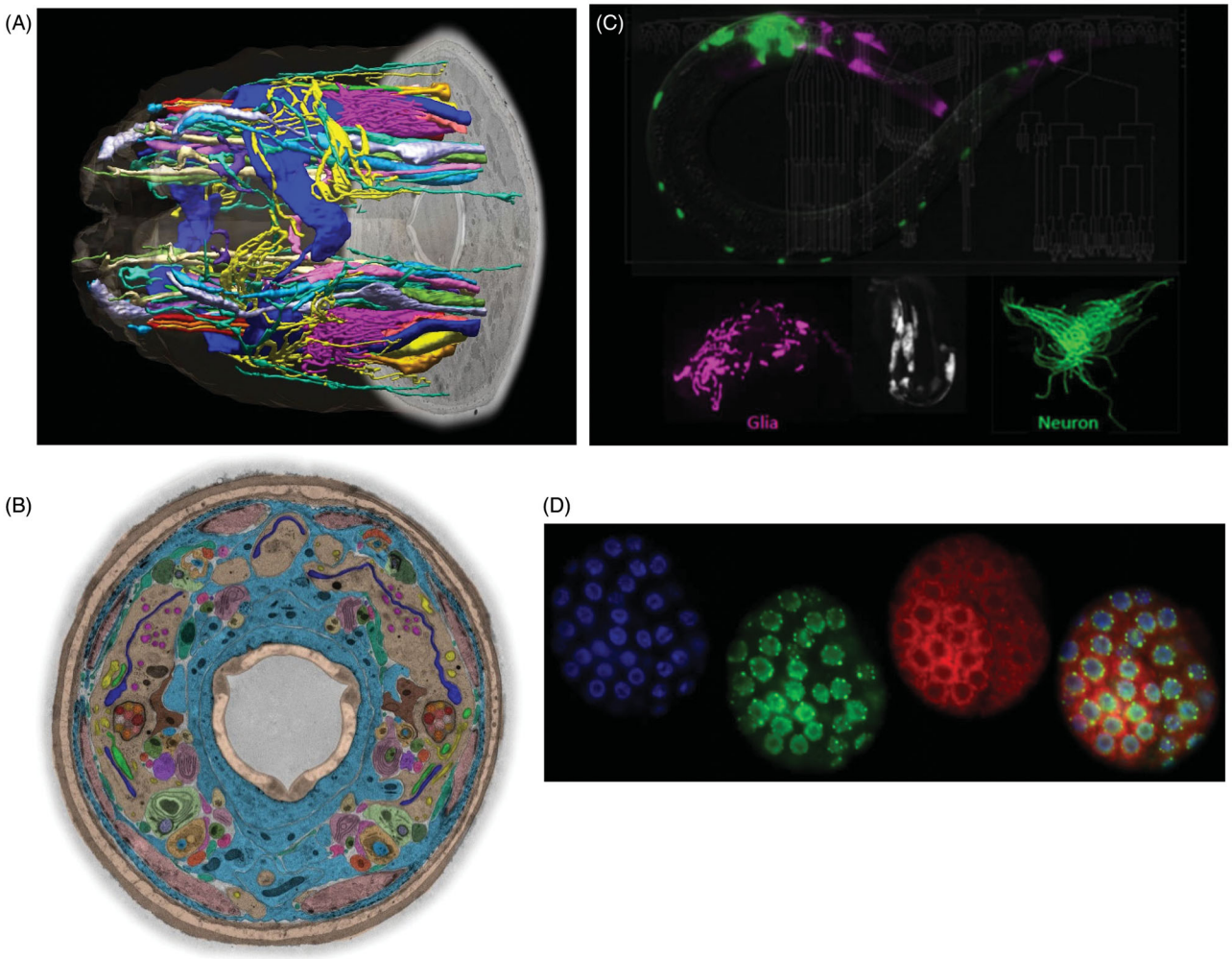

Figure 7. *C. elegans* microscopy, Part II. Panels (A) and (B): Graphical model of high-resolution system 3D reconstruction of anterior sensory endings and TEM cross-section. 3D reconstruction of the cilia and dendritic endings of anterior sensory neurons modeled from 166 thin serial sections with superimposed example TEM cross-section of a high-pressure frozen/freeze-substituted (HPF-FS) *C. elegans* hermaphrodite animal. (C) *C. elegans* as a model to study single glia-neuron interactions, mixed media. (D) Fluorescent staining of subcellular structures in the germ line of an adult hermaphrodite. DAPI stains DNA (blue), Alexa Fluor Plus 488-conjugated antibody labels histone H4 (green) and MitoTracker Orange stains mitochondria (red). (Color images available in the electronic version of this photo gallery.)

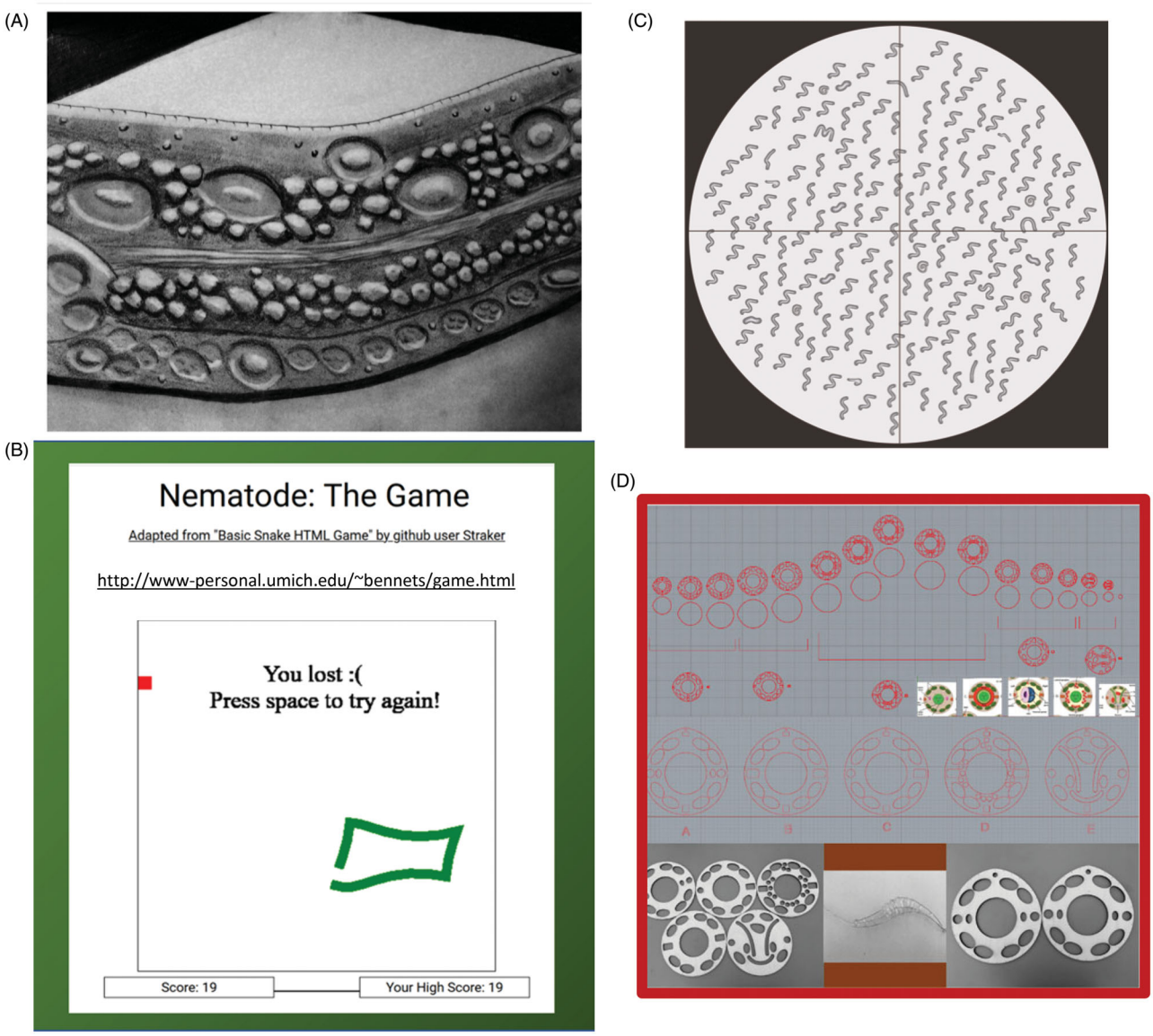

Figure 8. *C. elegans* mixed media art. (A) 'Transparency hit by light': P cell divisions under Nomarski microscope to determine developmental time, in honor of J. Sulston's work on cell lineages, showing cells posterior of gonad in a late L1 worm, after P9's 4th cell division. Anterior is left and ventral is down. P cells are positions along the ventral cord, and I cells are surrounded by gut granules. Graphite pencil drawing based on a Nomarski microscopy image. (B) 'Opening to neurobiology': view through a microscope eyepiece illustrating S. Brenner's forward genetic screen for uncoordinated worms. In the field of view, are coiled, kinky, dumpy and omega-shaped mutant worms. Paralyzed worms are depicted as straight or less curvy worms. Created using Adobe Illustrator. (C) *C. elegans* is the star of a video game: *Nematode, The Game*! It is like 'Snake', the nematode moves in a sinusoidal way and pirouettes off in a random direction every once in a while, sometimes into itself. A perfect blend of skill and luck! (Play here: http://www-personal.umich.edu/∼bennets/game.html..) (D) *C. elegans* body cross sections translated in CAD (Computer Aided Design-Rhino). Used to make cardboard or acrylic discs, combine them with metallic wire and build a worm prototype.

Figure 9. *C. elegans* embroidery, textile, fabric and gastronomy. (A) 'Wormville', hand embroidery. Depicts *C. elegans* living in what would be their imaginary own little village. Participated in Worm Art show in worm meeting 2019 in LA, where it won an award. (B) Front part of a T-shirt, made for Javier Apfeld by his labmates, for his graduation from Cynthia Kenyon's lab, mosaic representation of *C. elegans* lifespan curve. (C) Front part of a T-shirt, made for Jen Whangbo by her labmates at the Kenyon Lab, referring to her research on Q neuroblast migration. (D) Worm nervous system cake.

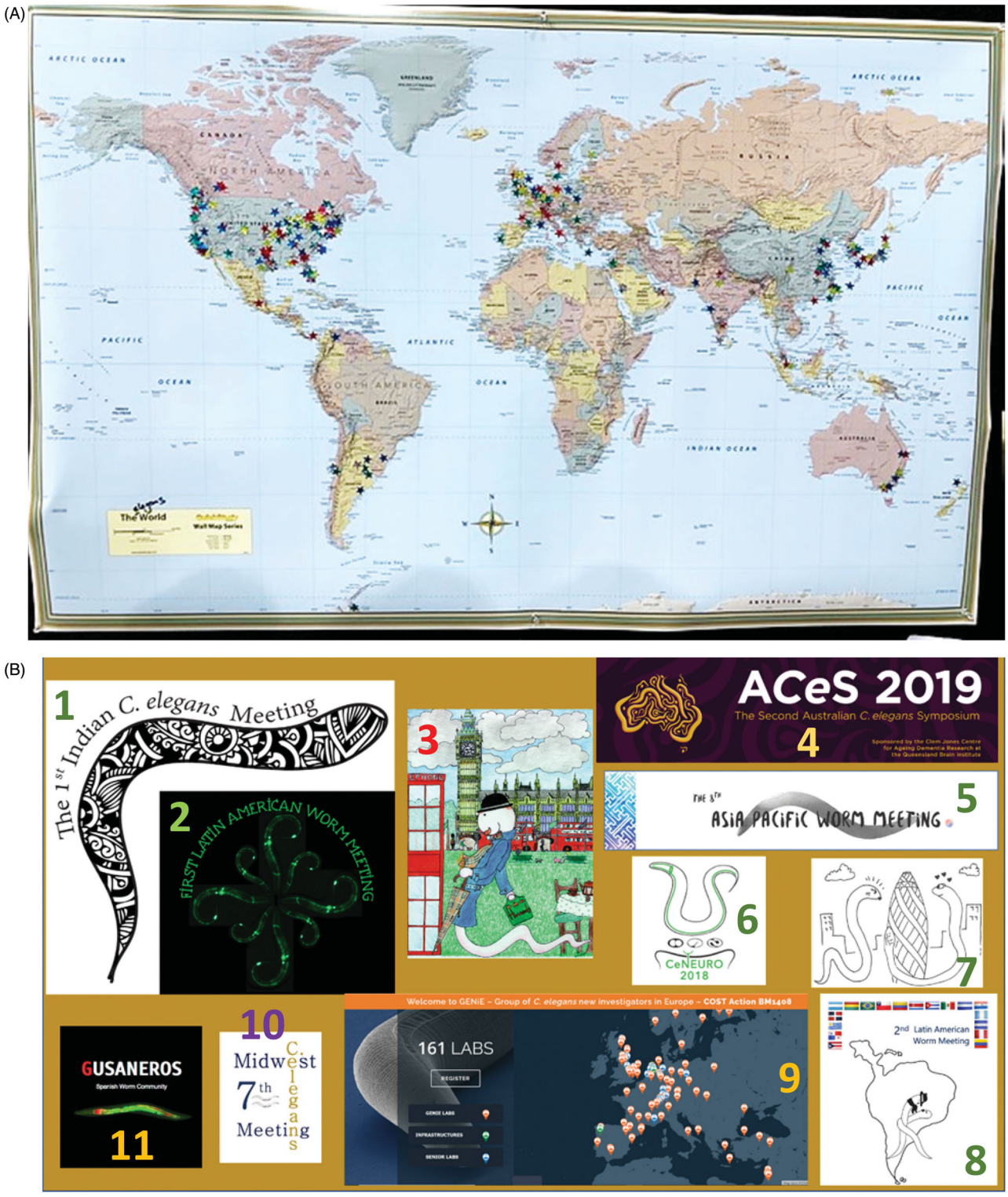

Figure 10. *C. elegans* thrives around the world. (A) A world map, featuring locations of *C. elegans* labs, collective work by attendants of the 2019 International *C. elegans* Meeting, California. This initiative was part of the beloved Worm Art Show, organized for years by Ahna Skop. (B) A collection of worm meetings logos from around the globe, featuring: 1. 1st Indian *C. elegans* meeting logo, 2. 1st Latin American *C. elegans* meeting logo, to signify the visit of Martin Chalfie, hence the GFP. 3. 1st UK *C. elegans* meeting logo, 4. 2nd Australian *C. elegans* meeting banner, 5. 8th Asia Pacific worm meeting logo, 6. CeNeuro 2018 logo (topic meeting, USA), 7. 2nd UK worm meeting, featuring the Gherkin tower, 8. 2nd Latin American Worm Meeting, 9. Website screenshot of GENiE, group of *C. elegans* investigators in Europe and neighboring areas, locations of labs highlighted. 10. 7th Midwest *C. elegans* meeting logo (regional, USA), 11. Gusaneros, a Spanish-speaking worm community.

Credits

We are grateful to all these talented people, who enthusiastically contributed to this gallery.

Figure 1. Photos taken by Tabitha Doniach, generously contributed by Scott Emmons (Einstein College of Medicine, USA), with the kind assistance of Jonathan Hodgkin (University of Oxford, UK).

Figure 2. (A) Alexandra R. Willis (Reinke Lab, University of Toronto, Canada); (B) Sebastián Giunti and María José De Rosa (Rayes and De Rosa Labs, Instituto de Investigaciones Bioquímicas Bahía Blanca - INIBIBB, Argentina).

Figure 3. Amanda G. Charlesworth (Claycomb Lab, University of Toronto, Canada).

Figure 4. (A) Mirella Hernandez Lima (Truttmann Lab, University of Michigan, USA); (B) Henrik Bringmann (Max Planck Institute, Germany), photo contributed by David Raizen (University of Pennsylvania, USA); (C) Elizabeth Glater (Pomona College, USA), Luisa Scott (University of Texas at Austin, USA), and Madeleine Huong Le (Flansburgh Architects, USA); (D) Sonja Soo (Van Raamsdonk Lab, McGill University, Canada).

Figure 5. (A) Bianca Pereira, (Alcedo Lab, Wayne State University, USA); (B) Kübra Akbaş (Coppélia Research Lab-Mummolo Group, New Jersey Institute of Technology, USA); (C) Madhushree Kamak; (D) Anushka Deb; (C) and (D): Koushika Lab, DBS-TIFR, India.

Figure 6. (A) and (B): Mark W. Moyle; (C) Javier Marquina-Solis, Mark W. Moyle; (A)-(C): Colón-Ramos Lab, Yale University, USA. Collaborators: Hari Shroff, Zhirong Bao, William Mohler; (D) Annika Traa (Van Raamsdonk Lab, McGill University, Canada).

Figure 7. (A) and (B): David Doroquez, Cristina Berciu, James R Anderson, Piali Sengupta, Daniela Nicastro (Sengupta and Nicastro Labs, Brandeis University, USA, published in *eLife*, PMID: 24668170); (C) Aakanksha Singhvi, Stephan Raiders and Maria Purice (Singhvi Lab, Fred Hutchinson Cancer Research Center, USA); (D) Surojit Sural (Hsu Lab, University of Michigan, USA).

Figure 8. (A) and (B): Eugene Jennifer Jin, (Y. Jin Lab, University of California, San Diego, USA); (C) Bennet Sakelaris (Gourgou and Booth Groups, University of Michigan, USA); (D) Manali Desai, Jiwen Chen, Richard Wall, Fee Christoph, Melinda Li (Gourgou Group, University of Michigan, USA).

Figure 9. (A) Hala Tamim El Jarkass (Reinke Lab, University of Toronto, Canada); (B) Contributed by J. Apfeld (Northeastern University, USA); (C) Contributed by J. Whangbo (Harvard Medical School, USA); (D) Lindsey Lopes and Jessica Schwartz (Raizen Lab, University of Pennsylvania, USA).

Figure 10. (A) Photo contributed by Ahna Skop (University of Wisconsin, USA). (B) 1. Madhushree Kamak (Koushika lab, DBS-TIFR, India); 2. Andrea Calixto (Universidad Mayor, Chile, and Centro Interdisciplinario de Neurociencia de Valparaiso, Chile), and Ines Carrera (Institut Pasteur de Montevideo, Uruguay); 3. Giovanna Lalli (UK Dementia Research Institute), we thank Giovanni Lesa for help; 4. Logo owned by The University of Queensland, Australia; 5. Kyoung-Hye Yoon (Yonsei University, Republic of Korea), we thank Seung-Jae V. Lee for help; 6. Tari Tan (Harvard Medical School, USA), we thank Denise Ferkey for help; 7. David Gems (University College London, UK); 8. Permission provided by organizers; 9. From GENiE website; 10. Permission provided by organizers; 11. We thank Julian Ceron Madrigal for help.

ORCID

Eleni Gourgou http://orcid.org/0000-0003-1561-5545