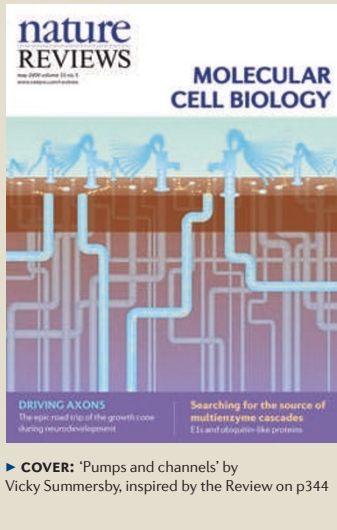




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The proteins that transport ions across membranes fall into two general classes: high-speed ion channels, through which ions rush down gradients of concentration and electric potentials, and low-speed pumps, which actively push ions against these gradients. Channels need only one gate, whereas pumps need at least two gates that should never be open at the same time. Because of these fundamental differences, explains David C. Gadsby (page 344), ion channels and ion pumps have traditionally been viewed as entirely different entities. However, atomic-resolution structures and functional measurements of examples from both classes suggest that ion channels and pumps might not be as different as was once thought. Gadsby concludes, however, that there is no reason to abandon the 'one gate versus two gates' formalism to distinguish pumps from channels.

Another example of the evolution of ideas in a field is provided by coat protein I (COPI), which functions in vesicular transport. Victor Hsu and colleagues propose in an Opinion (page 360) that two long-held views on COPI vesicle formation need to be revised. First, COPI vesicle formation requires additional factors besides ARF1 (a small GTPase) and coatamer (the major coat protein complex). Second, the GTPase-activating protein that catalyses ARF1 deactivation has more complex roles than previously envisioned. The authors suggest that it functions both as a negative regulator of ARF1 and as its effector by being part of the COPI complex in promoting both vesicle formation and cargo sorting.

As always, we strive to follow paradigm shifts and new opinions throughout the field of molecular cell biology — regardless of how such challenges play out, they provide food for thought and ultimately strengthen our understanding of how things work.

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