



Cover: Confocal micrograph of a pluteus-stage sea urchin embryo. The hindgut is in the centre. Shown are plasma membranes (yellow), a fluorescent dye (blue) used to track ATP-binding cassette (ABC) transporter activity, and pigment cells (red) that express the transporter ABCC5a, which is required for hindgut invagination. See Research article by Shipp et al. on p. 3537.

SPOTLIGHT

- 3453 An interview with Mike Levine
Vicente, C.

REVIEW

- 3456 Heparan sulfate proteoglycans: a sugar code for vertebrate development?
Poulain, F. E. and Yost, H. J.

STEM CELLS AND REGENERATION

- 3468 Dynamic transcriptional symmetry-breaking in pre-implantation mammalian embryo development revealed by single-cell RNA-seq
Shi, J., Chen, Q., Li, X., Zheng, X., Zhang, Y., Qiao, J., Tang, F., Tao, Y., Zhou, Q. and Duan, E.
- 3478 Lin-28 promotes symmetric stem cell division and drives adaptive growth in the adult *Drosophila* intestine
Chen, C.-H., Luhur, A. and Sokol, N.
- 3488 LIF supports primitive endoderm expansion during pre-implantation development
Morgani, S. M. and Brickman, J. M.
- 3500 Trithorax regulates systemic signaling during *Drosophila* imaginal disc regeneration
Skinner, A., Khan, S. J. and Smith-Bolton, R. K.

RESEARCH REPORT

- 3512 A non-signaling role of Robo2 in tendons is essential for Slit processing and muscle patterning
Ordan, E. and Volk, T.

RESEARCH ARTICLES

- 3519 Revising the embryonic origin of thyroid C cells in mice and humans
Johansson, E., Andersson, L., Örnros, J., Carlsson, T., Ingesson-Carlsson, C., Liang, S., Dahlberg, J., Jansson, S., Parrillo, L., Zoppoli, P., Barila, G. O., Altschuler, D. L., Padula, D., Lickert, H., Fagman, H. and Nilsson, M.
- 3529 Epigenetic regulation of *Atoh1* guides hair cell development in the mammalian cochlea
Stojanova, Z. P., Kwan, T. and Segil, N.
- 3537 ABCC5 is required for cAMP-mediated hindgut invagination in sea urchin embryos
Shipp, L. E., Hill, R. Z., Moy, G. W., Gökırmak, T. and Hamdoun, A.

- 3549 Polarized Rac-dependent protrusions drive epithelial intercalation in the embryonic epidermis of *C. elegans*
Walck-Shannon, E., Reiner, D. and Hardin, J.

- 3561 Allorecognition, via TgrB1 and TgrC1, mediates the transition from unicellularity to multicellularity in the social amoeba *Dictyostelium discoideum*
Hirose, S., Santhanam, B., Katoh-Kurosawa, M., Shaulsky, G. and Kuspa, A.

- 3571 A germ cell determinant reveals parallel pathways for germ line development in *Caenorhabditis elegans*
Mainpal, R., Nance, J. and Yanowitz, J. L.

TECHNIQUES AND RESOURCES

- 3583 4D atlas of the mouse embryo for precise morphological staging
Wong, M. D., van Eede, M. C., Spring, S., Jevtic, S., Boughner, J. C., Lerch, J. P. and Henkelman, R. M.
- 3592 Large-scale live imaging of adult neural stem cells in their endogenous niche
Dray, N., Bedu, S., Vuillemin, N., Alunni, A., Coolen, M., Krecsmarik, M., Supatto, W., Beaupaire, E. and Bally-Cuif, L.
- 3601 Tracking and transforming neocortical progenitors by CRISPR/Cas9 gene targeting and *piggyBac* transposase lineage labeling
Chen, F., Rosiene, J., Che, A., Becker, A. and LoTurco, J.

CORRECTIONS

- 3612 A transport and retention mechanism for the sustained distal localization of Spn-F-IKK ϵ during *Drosophila* bristle elongation
Otani, T., Oshima, K., Kimpara, A., Takeda, M., Abdu, U. and Hayashi, S.
- 3613 Defining the three cell lineages of the human blastocyst by single-cell RNA-seq
Blakeley, P., Fogarty, N. M. E., del Valle, I., Wamaita, S. E., Hu, T. X., Elder, K., Snell, P., Christie, L., Robson, P. and Niakan, K. K.
- 3614 The advancement of human pluripotent stem cell-derived therapies into the clinic
Thies, R. S. and Murry, C. E.