Katsunuma et al., http://www.jcb.org/cgi/content/full/jcb.201509020/DC1

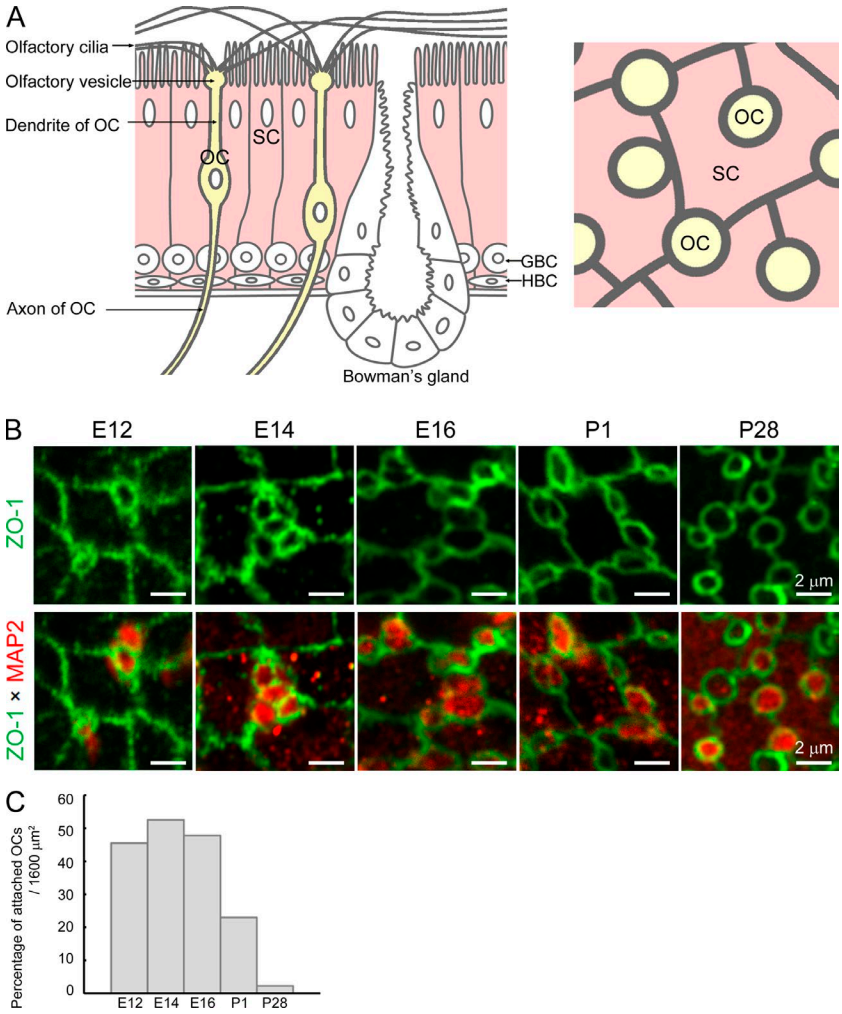


Figure S1. **Schematic illustration of mouse OE.** (A, left) Left: schematic illustration of a vertical plane of matured mouse olfactory epithelium (OE). Olfactory cilia are protruded from olfactory vesicle, which is located at the tip of dendrite of OCs. The axons of OCs extend to the olfactory bulb. Bowman's glands are tubuloalveolar structures, which secrete their products onto the epithelium surface. Basal cells (globosal basal cells and horizontal basal cells) are tissue stem cells in the OE. (right) Schematic illustration of a surface view of the OE at the junctional level. OC, olfactory cell; SC, supporting cell; GBC, globosal basal cell; HBC, horizontal basal cell. (B) Immunofluorescence signal for ZO-1 (top) and for ZO-1 (green) and MAP2 (red; bottom) on the apical surface of the mouse OE from E12 to P28. Note, MAP2 distribution was gradually lost from the tips of the dendrites after P1. (C) Quantitative analysis of attached OCs during development. Histogram represents the percentage of attached OCs on the apical surface of the mouse OE from E12 to P28 in 1,600 μm^2. Data were collected from three individuals and were quantified using three fields in each individual.

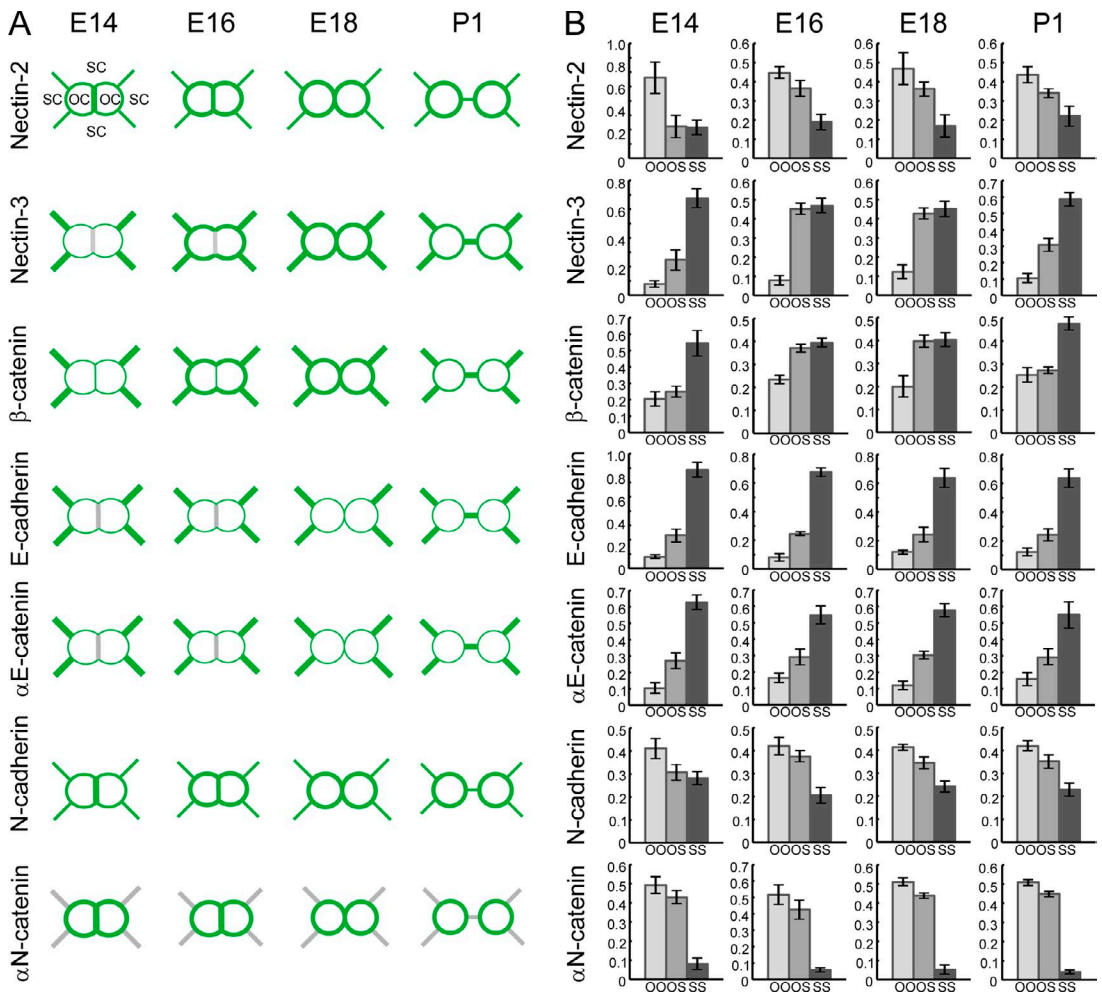


Figure S2. **Summary of distribution patterns of nectins, cadherins, and catenins in the developing mouse OE.** (A) Schematic illustrations of the distribution patterns of nectin-2, nectin-3, β-catenin, E-cadherin, αE-catenin, N-cadherin, and αN-catenin in the OE during development. Bold or narrow green lines indicate the relative intensities of accumulations of nectins, cadherins, or catenins at the junctions during development. Gray lines indicate the junctions in which nectin-3, E-cadherin and αE-catenin, and αN-catenin are not distributed. (B) Quantitative analysis of the relative intensity of nectin-2, nectin-3, β-catenin, E-cadherin, αE-catenin, N-cadherin, and αN-catenin at OO, OS, and SS boundaries during development. Histogram represents the mean of mean relative intensity calculated from normalized fluorescence intensity of six specimens. Results shown are the mean ± SD; $n = 6$. Statistical test was not applied. SS, junction between SCs; OS, junction between OCs and SCs; OO, junction between OCs.

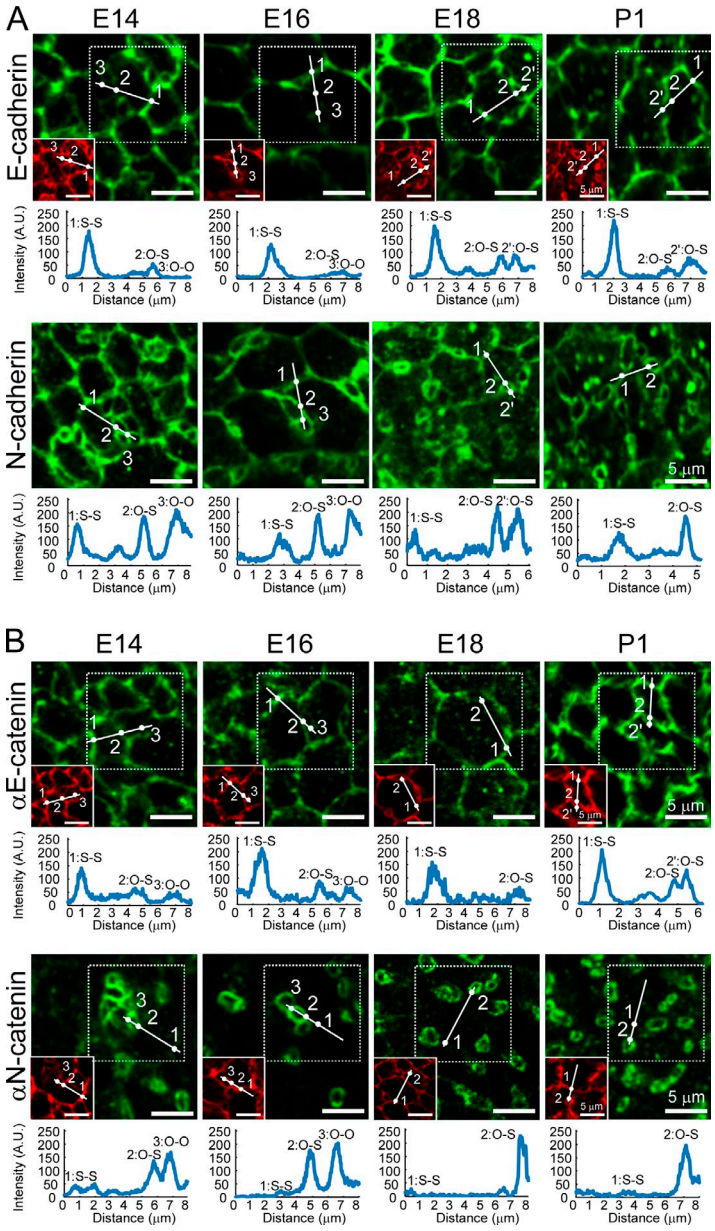


Figure S3. **Distribution change of cadherins and catenins in the developing mouse OE.** (A) Distribution patterns of E-cadherin (top) and N-cadherin (bottom) in the OE on E14, E16, E18, and P1 are shown. Immunostainings for E-cadherin or N-cadherin (green) are shown. Insets in the figures for E-cadherin show immunostaining for N-cadherin (red), which indicates all boundaries. A representative image is shown of nine independent experiments. The graphs indicate the densitometric traces of the lines in the photographs of cadherin fluorescence. Peaks correspond to the signals at the junction marked with the same number in the upper figures. S-S, junction between SCs; O-S, junction between OCs and SCs; O-O, junction between OCs. (B) Distribution patterns of αE-catenin (top) and αN-catenin (bottom) in the OE on E14, E16, E18, and P1 are shown. Immunostaining for αE-catenin or αN-catenin (green) are shown. Inserts show immunostaining for β-catenin (red), which indicates all boundaries. A representative image is shown of nine independent experiments. The graphs indicate the densitometric traces of the lines in the photographs of catenin fluorescence. Peaks correspond to the signals at the junction marked with the same number in the upper figures. S-S, junction between SCs; O-S, junction between OCs and SCs; O-O, junction between OCs.

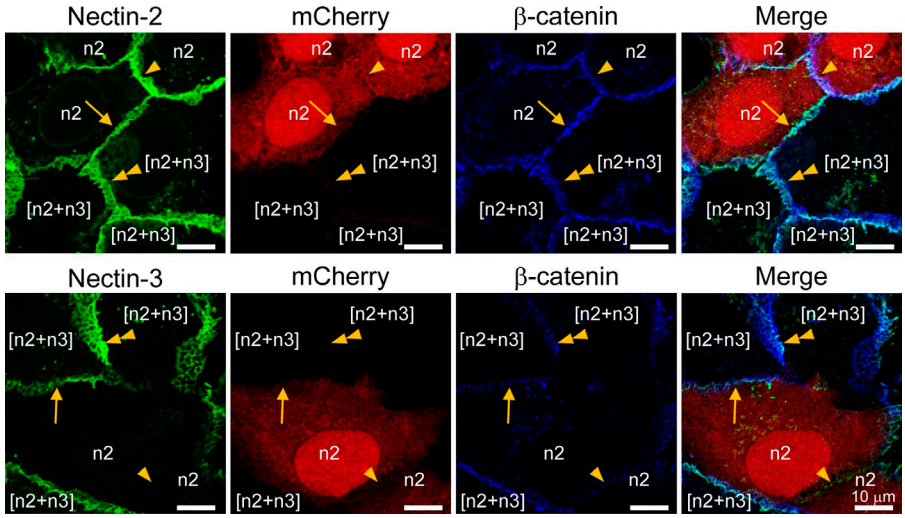


Figure S4. **Nectin and β-catenin distribution in a mixed culture of nectin transfectants.** (top) Immunofluorescence signals for nectin-2, mCherry, and β-catenin in a mixed culture of n2- and [n2+n3]-293 cells at a confluent state. (bottom) Immunofluorescence signals for nectin-3, mCherry, and β-catenin in a mixed culture of n2- and [n2+n3]-293 cells at a confluent state. n2, HEK293 transfectants expressing nectin-2; n2+n3, HEK293 transfectants expressing nectin-2 and -3. Arrowheads, junctions between n2- and n2-293 cells; arrows, junctions between n2- and [n2+n3]-293 cells; double arrowheads, junctions between [n2+n3]- and [n2+n3]-293 cells.

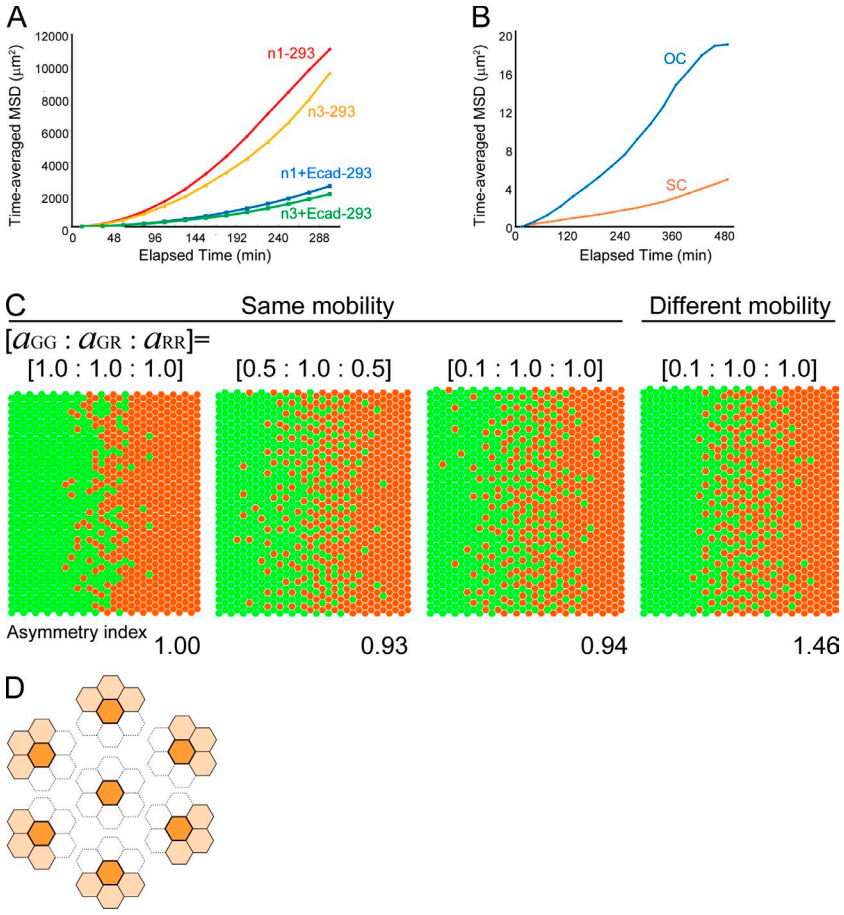
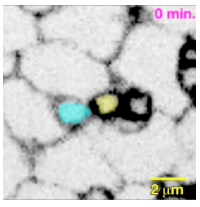
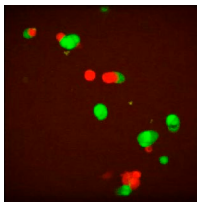


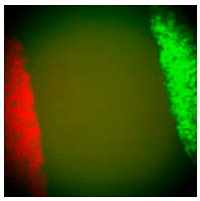
Figure S5. **Investigation of asymmetric distribution of two types of cells using a hexagonal lattice.** (A) Plots of the time-averaged mean-square displacements (MSD) of the HEK293 transfectants. The square displacements of the same cell type were collected and averaged in time. The MSD curves of the observed cell movements indicate as a function of time. (B) Plots of the time-averaged MSD of OCs or SCs in the organ culture of the OE. The averaging was performed in time. The MSD curves of the observed cell movements indicate as a function of time. (C) Pattern formation of asymmetric distribution of two types of cells in a hexagonal lattice (computer simulation). Hexagons G and R were initially situated in the left and right half sides. Repetition of local hexagon rearrangements took place so that the total adhesiveness of boundaries of the pattern became stronger. The adhesiveness strengths of boundaries between hexagons G and G, hexagons G and R, and hexagons R and R were a_{GG}, a_{GR}, and a_{RR}, respectively. (left) Case where the same adhesiveness interaction worked between all hexagons ($\{a_{GG}, a_{GR}, a_{RR}\} = \{1.0, 1.0, 1.0\}$) and hexagons G and R behaved in the same mobility. The hexagons fluctuated at random, but the distribution of hexagons G and R was symmetrical. There was no tendency for one type of hexagons to enclose another type of hexagons. Pattern is at 10,000 steps. (left middle) Case where heterophilic interactions (a_{GR}) were much stronger than homophilic ones (a_{GG}, a_{RR}, $\{a_{GG}, a_{GR}, a_{RR}\} = \{0.5, 1.0, 0.5\}$) and hexagons G and R behaved in the same mobility. The distribution of hexagons G and R was symmetrical. There was clear tendency for one type of hexagons to enclose another type of hexagons. Pattern is at 10,000 steps. (right middle) Case where homophilic interactions were asymmetric, that is, a_{RR} was large, whereas a_{GG} was small ($\{a_{GG}, a_{GR}, a_{RR}\} = \{0.1, 1.0, 1.0\}$). Other conditions were the same as the simulation of left middle. The result was similar to the simulation of left. Pattern is at 12,000 steps. (right) Case where the mobility of hexagon G was larger than that of hexagon R. Other conditions were the same as the simulation of right middle. Pattern is at 12,000 steps. Numerals indicate asymmetry index. (D) Illustration for explanation of a method to define an aggregate of four hexagons. Six aggregates of four hexagons are shown around hexagon A (dark orange). One of six aggregates was selected at random for local cell rearrangement.



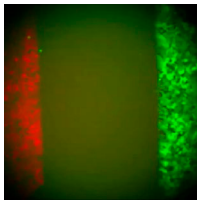
Video 1. **Time-lapse microscopy of the organ culture of the OE prepared at E14 from R26-ZO1-EGFP mice.** Black and white reversal images are shown. OCs are indicated by blue and yellow. Images were captured every 30 min.



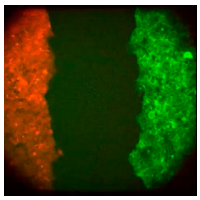
Video 2. **Time-lapse microscopy of a co-culture of neuro-2a cells expressing E-cadherin and EGFP (green) and those expressing N-cadherin and mCherry (red).** Images were captured every 20 min.



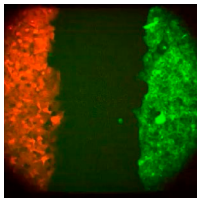
Video 3. **Time-lapse microscopy of a mosaic forming assay of HEK293 cells expressing nectin-3 and EGFP (green) and those expressing nectin-3 and mCherry (red).** Images were captured every 20 min.



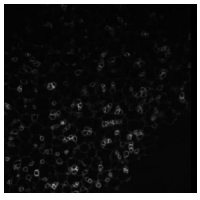
Video 4. **Time-lapse microscopy of a mosaic forming assay of HEK293 cells expressing nectin-1 and EGFP (green) and those expressing nectin-3 and mCherry (red).** Images were captured every 20 min. Nectin-1– and nectin-3–expressing cells were intermingled at the border.



Video 5. **Time-lapse microscopy of a mosaic forming assay of HEK293 cells expressing nectin-3 and mCherry (red) and those expressing nectin-3 and E-cadherin-EGFP (green).** Images were captured every 20 min. These cells did not invade the counter colony each other.



Video 6. **Time-lapse microscopy of a mosaic forming assay of HEK293 cells expressing nectin-1 and mCherry (red) and those expressing nectin-3 and E-cadherin-EGFP (green).** Images were captured every 20 min. Nectin-1–expressing cells invaded the counter colony of nectin-3– and E-cadherin–expressing cells.



Video 7. **Time-lapse microscopy of the organ culture of the OE prepared at E14 from R26-ZO1-EGFP mice.** Images were captured every 20 min. Visual field deviation was corrected by ImageJ software.