SUPPLEMENTARY NOTES

1. Previous studies with cerebellar models.
Several types of cerebellar animal models have been tested in spatial navigation tasks: mutant mice\(^1\), hemicerebellectomized rats\(^2\), and rats with cerebellar input lesions\(^3\). All cerebellar animals showed impaired learning capabilities when tested with the classical Morris water maze, a task in which the animal has to find a fixed hidden platform from either multiple or a unique starting position\(^4\). The consensus that emerged from these studies points toward a role of the cerebellum in mediating the procedural component of the spatial navigation function\(^5\). Likewise, recent data suggested that the procedural impairment observed in cerebellar animals could also induce a more cognitive impairment since the acquisition of a declarative spatial memory relies on the learning of a correct explorative behavior\(^6-8\).

2. Electrophysiological properties of the L7-PKCI mouse model.
De Zeeuw and colleagues have demonstrated that adult L7-PKCI mutant mice have intact baseline discharges of Purkinje cells and no persistent multiple climbing fiber innervation\(^9\). In fact, even during an optokinetic reflex task, which can be used during visuo-vestibular training, both simple spike and complex spike responses of Purkinje cells appear normal\(^10\).

2. Procedural learning and PF-PC LTD mechanism.
Procedural learning can be defined as the process that permits to execute a new action properly\(^11\). In particular, this action has to be optimal with respect to the task to be solved. Our hypothesis of a role of PF-PC LTD in the procedural component of navigation was inspired by the theory that considers the cerebellar learning process as an error based system\(^12-14\). Marr-Albus-Ito theory postulates that the climbing fibers convey error information to the parallel fiber - Purkinje cell synapses and trigger a modulation of their strength via the LTD mechanism. Ito showed that in VOR adaptation experiments PF-PC LTD is likely to constitute the neural substrate of such an error-driven motor learning process\(^15\). In the case of spatial navigation, the trajectory performed by the animal must be adapted to the spatial context and optimized to lead directly to the goal.
References