The most compelling computational issue in neuoscience is to determine the algorithmic structure of sensorimotor loops (figure).

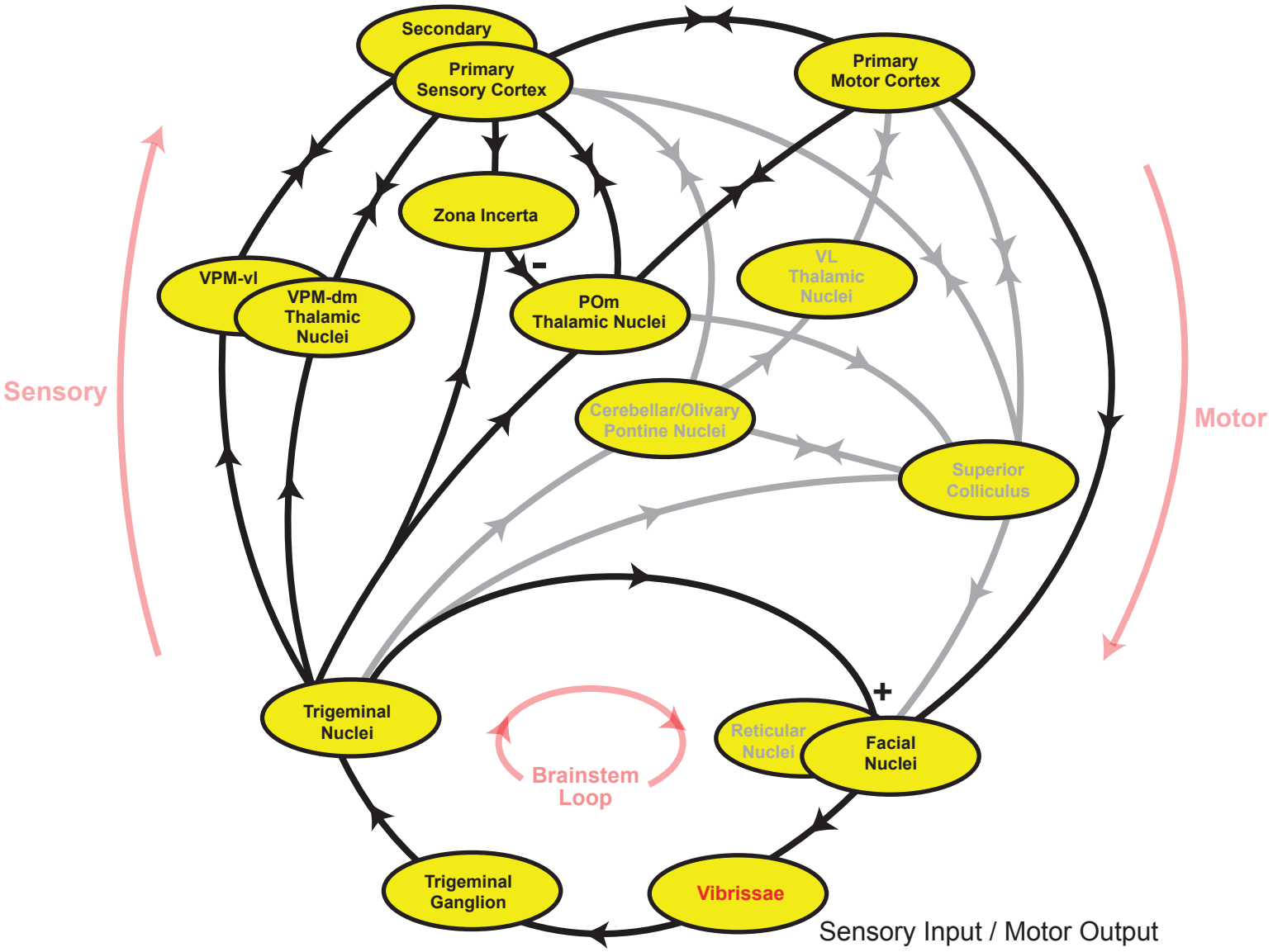
Why is this important?

The existence of nervous systems relates to mobility.
Thus sensorimotor loops govern basic aspects of neuronal computation.

What are the critical questions?

1. The structure of most sensorimotor systems and all mammalian realizations involves multiply nested loops. How are motor outputs arbitated among these loops? Perhaps brainstem/spinal motoneurons play a critical role in decisions.

2. The structure of mammalian realizations sensorimotor system is modular, not unlike that of engineered control systems. Why? What are the evolutionary pressures that lead to modularity, i.e., what is the cost of complexity?



The greatest intelluctual embarassment in neuroscience is the lack of wiring diagrams for all but parts of selected “simple” circuits.

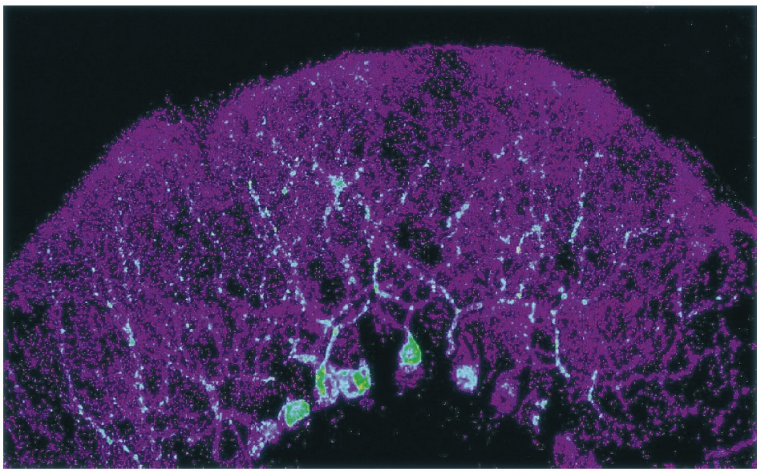
Why is this important?

Wiring diagrams constrain and in some cases define function.

What is needed?

1. Input from comparative neuroanatomy - on molecular through systems levels - to define scaling laws, motiffs, ...

2. Tools to map area to area connectivity. One example is the antorgrade/ retrograde viral labeling techniques pioneered by Peter Strick and others.



3. Tools to label cell to cell. One example is the proposed transsynaptic labeling with viruses from Ed Callaway and others.

4. Tools to map cell to cell. One example is block-face imaging, such as the EM recent effort by Winfried Denk and coworkers.