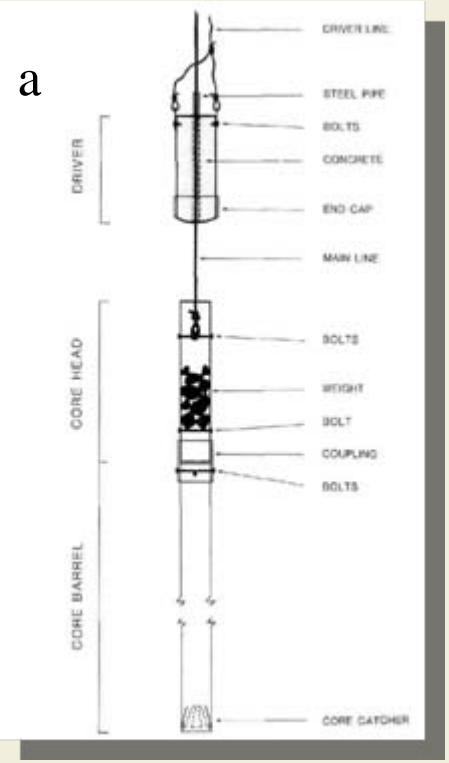
# A Universal Percussion Corer for Sampling Lake Sediments

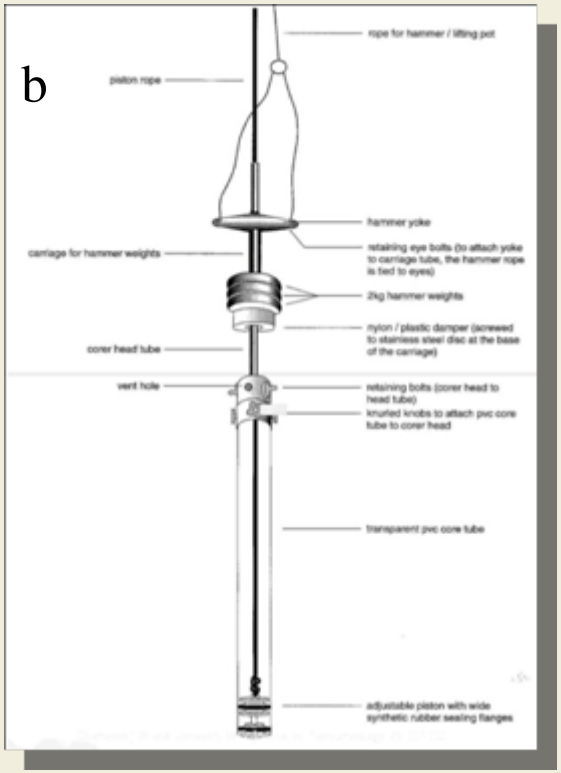
Jocelyne C. Bourgeois, Konrad Gajewski
and Michael N. Demuth

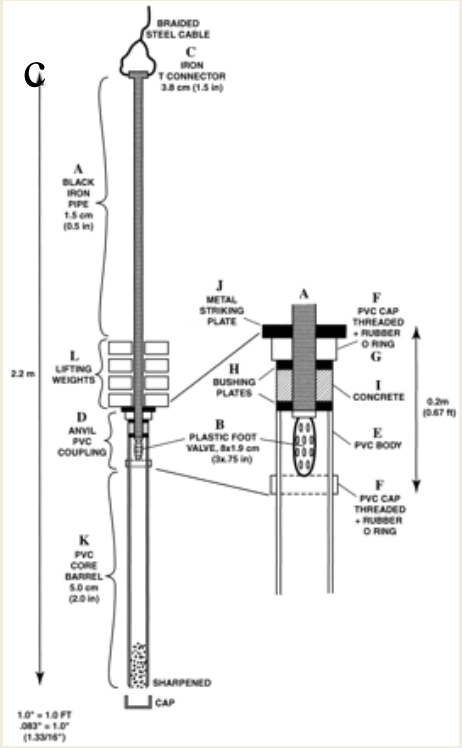
# Percussion coring in lake sediments

- Percussion coring systems rely on a moveable weight to push a core barrel into a sediment.
- The corer can be attached to a cable and lowered through the water column until it reaches the sediment. A secondary line is then used to raise and drop the driver on top of the core barrel.
- These systems are, in principle, unrestrained by water depth (they do not require metal rods). However, depth is a constraint for those systems that require a scuba diver.
- Percussion coring systems variably use pistons, core catchers or a one-way check valve to retain the core.
- They are single drive corers and are therefore, limited by the length of the core barrel.

# Schematics of rope-operated percussion corers




a. Reasoner (1986); b. Chambers and Cameron (2001); c. Cawley and Parker (2001).

# Universal percussion coring system

- The Universal percussion corer is a relatively simple system used to recover sediment cores from the water-sediment interface. It is lightweight and relatively inexpensive (less than $1,000).
- It consists of three major components: the Universal core head, the core barrel, and the slide hammer (used with or without bronze gravity weights).
- Like other percussion coring system, it can be deployed using ropes. Two lines are used: one to raise and lower the corer and the other to operate the slide hammer.
- The corer can be lowered from a stable platform (ice) or an anchored platform (boats).

# Major components

- **Universal core head:** can be used with a “T” handle (for shallow marsh or wetlands), aluminum extension rods (up to 15 m), or with ropes in deeper water.
- The core head has a one-way check valve that permits the core barrel to free flush during deployment and also allows it to retain the core sample without using core catchers.

Universal core head
(Aquatic Research Instruments)

# Major components (cont.)

- Thin-walled, clear, **polycarbonate core barrels:** usually come in two lengths: 120 cm or 240 cm (x 68 mm x 71 mm). These are readily available from plastic distributors. They can be easily drilled, cut or split.
- **Slide hammer assembly:** can be used with bronze gravity weights.

Universal core head kit (Watermark)

Slide hammer (Aquatic Research Instruments)

## Major components (cont.)

- Optional **incremental core extruding apparatus**: allows one to gradually extrude sediments in 0.5 or 1.0 cm increments. When the bottom plug is in place, the barrel can be attached directly to the extruding apparatus.

# Core retrieval and sample extraction

Cumming et al. (2009)

www.env.gov.bc.ca/epd/regions/okanagan/waterqual/pdf/osoyoos-paleo-2009.pdf

## Some advantages, disadvantages, and other considerations

- Ideal for working in remote areas where weight is a constraint.
- Is easily assembled, lightweight, and inexpensive.
- The corer / slide hammer can be lifted to the surface by hand, from small inflatable boats, by two persons.
- In deep water and for the retrieval of longer cores, a pulley system and a more stable platform, such as ice, is recommended.
- The use of high quality ropes is important to prevent stretching or excessive twist and kinks.
- In deeper lakes, the tangling of the two operating ropes can be problematic.

# Some advantages, disadvantages, and other considerations (cont.)

- If care is taken at the initial stage, it is possible to recover, intact, a sample at the sediment water interface.
- The clear core barrels allow visual examination of the core before extrusion.
- The length of the sediment record is limited by the length of core barrel.
- The bottom of the core tube must be plugged before breaking the air-water interface (with core extruding plug or poly end cap) to prevent loss of sample.
- Caution must be exercised with the slide hammer / bronze gravity weight when bringing the coring system to the surface if injury is to be avoided.

# Experience with the Universal Percussion Corer at the GSC/NCD

- Two Universal percussion coring systems were bought in 2010.
- One corer was tested in southern Chile in February 2010 during a collaborative research project to study recent glacier fluctuations in the region.

- The field trip included Canadian, Chilean, and American scientists but only two participants were involved in the paleolimnology study.

# Experience with the Universal Percussion Corer at the GSC/NCD (cont.)

- Due to the complicated logistics, it was essential that the coring equipment be lightweight, easy to assemble and easy to operate from two small inflatable boats.
- The lakes we were able to access, near the Jorge Montt Glacier, proved to be quite young and we were only able to extract short sediment cores from 5 m deep lakes. We also used the Universal core head with the “T” handle to recover a short core from a shallow marsh.
- We found the coring system to perform well in the field but its full potential could not be properly assessed due to various particulars of the expedition.

## References

Cawley, J.C. and Parker, B. (2001). An inexpensive diver assisted percussion coring device. Journal of Sedimentology Research, 71, 863-866.

Chambers, J.W. and Cameron, N.G.(2001). A rod-less piston corer for lake sediments: an improved, rope-operated percussion corer. Journal of Paleolimnology, 25, 117-122.

Cumming, B.F., Gregory-Eaves, I., Jensen, V., Laird, K., Simpson, K., Sokal, M., Walker, I.R. (2009). Osoyoos Lake Sediment Core Project – Final Report. Final Report to the Okanagan Basin Water Board, 44p.

Resoner, M.A. (1986). An inexpensive, lightweight percussion core sampling system. Géographie physique et Quaternaire, 40, 217-219.