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**AN ELECTRONIC DEVICE THAT MEASURES SERIES RESISTANCE DURING
TEVC RECORDING IN *XENOPUS* OOCYTES**

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Xenopus laevis oocytes are an established expression system for ion channels. The two-electrode voltage-clamp (TEVC) technique is the method of choice because of its ease of use. Membrane currents due to expressed channels are large and range up to tens of microamperes.

TEVC recordings are compromised by two major sources of error:

1. The non-ideal geometry of the cell (space clamp error)
2. The electric resistance R_s of the intracellular structures located between the tip of the recording electrodes and the cell membrane (series resistance error).

Artifacts caused by this series resistance (R_s) deteriorate measurements considerably due to the large membrane currents. They fall into two groups:

1. The DC error caused by the voltage divider formed by R_s and the membrane resistance R_m .
2. The dynamic error caused by the lowpass filter formed by R_s and the membrane capacity C_m .

Therefore, R_s is an important parameter that would help to evaluate the recordings. We have designed an electronic instrument that can be used in conjunction with a standard TEVC amplifier (TURBO TEC series, npi electronic) to measure and display R_s automatically.

The instrument is based on the injection of symmetrical current pulses of 10 microamperes and a few kHz around the holding or resting potential of the cell. The membrane potential deviation that appears on the positive slope of the pulse is proportional to R_s and is measured using high precision sample-and-hold circuits controlled by a timing unit that is synchronized from the injection pulses applied. R_s is displayed on a digital meter with a resolution of 10 Ohms and can be also stored on a computer. R_s measurement can be started manually or through a TTL input. After the measurement the stored R_s value is displayed continuously until the next measurement is started. Therefore, measurement can be automated easily using standard lab software.

The high frequency, as well as the symmetry of the amplitude and duration of the applied pulses is very important in order to avoid DC changes of membrane potential which can lead to channel openings. Measurements obtained with this instruments show R_s values from 100 Ohms to a couple of kOhms. Oocytes with high R_s are not under TEVC control and their currents appear significantly altered. In some recordings high R_s values could be lowered by repositioning the current electrode.

This instrument is a useful tool that helps to avoid erroneous recordings and facilitates not only accurate TEVC recordings but also precise C_m measurements in *Xenopus* oocytes (see poster Schmitt et al., this volume).