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F

irst of all, I would like to give a warm welcome to the new CEO of IPEM, Rosemary Cooke. If you haven’t already, please take a look at her inaugural article on page 5 where she introduces herself and discusses her view of the future direction of IPEM.

Meanwhile, there have been changes to the lineup of our editorial board since the last issue. Farewell to Ryan Lewis as International Editor, and thank you for all your work on Scope. I am excited to announce that we now have a new Technologist Editor – Frances Rye who works in Poole and is keen to reintroduce technologist articles into Scope. We have been without an editor in this field for some time and I have been aware that we are not adequately representing this important contingent of IPEM. Hopefully the recruitment of Frances will redress the balance.

Scope aims to reflect the wide and varied membership of IPEM; however, we can only publish articles that are submitted to us. If you feel your specialism is not being represented, then please write an article for us. We are more than willing to give help and guidance if you need it. At the moment we are on the lookout for an Academic Editor and an Engineering Editor. If you would like any more information about either role then please do contact us.

If you turn to page 25 you can join me in celebrating the successes of several keen IPEM members who have won awards this year. I would like to highlight the many awards and bursaries that IPEM distributes. These range up to £2,000 in value and are available for you, the members, to apply for. Please see the IPEM website for more details: www.ipem.ac.uk/professionalmatters/prizesandawards. It is not too late to nominate or apply for awards this year and I encourage you to consider doing so.

Francis Duck concludes his series of historical features for IPEM. We really are grateful for his contributions and have received unanimous praise for his excellent articles.

The pedants among you may have noticed that the Scope format has been jazzed up. I approve of its more contemporary design, for which we must thank our excellent publishers Century One. Well, that just leaves me enough space to wish you all compliments of the season and a very Happy New Year.

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Gemma Whitelaw
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GEMMA WHITELAW EDITOR-IN-CHIEF
A miniature bidirectional telemetry system: \textit{in vivo} gastric slow wave recordings

Stomach contractions are initiated and coordinated by an underlying electrical activity known as slow waves. Electrical dysrhythmias have been associated with gastric dysmotility in several significant gastric disorders, notably gastroparesis and functional dyspepsia.

Electrical recordings taken directly from the stomach provide superior quantity and quality of data than cutaneous electrogastrography recordings, but are invasive and face greater technical constraints. Serosal or mucosal electrodes have cables that traverse the abdominal wall or a natural orifice, causing discomfort and possible infection and restrict mobility. These problems motivated the development of a wireless system, which, according to the authors' knowledge, is not available commercially.

The aim of this work was to develop a validated, accurate and reliable identification and monitoring device for recording gastric slow wave data. An ideal wireless system would be small, portable, implantable and power efficient, whilst reliable and dependable.

The bidirectional telemetric system constitutes a front-end transponder, a back-end receiver and a graphical user interface. The front-end module is designed to acquire data from four channels and consists of an analogue board and wireless system-on-chip which includes an ADC, a microcontroller and a 2.4 GHz transceiver. To prevent saturation, signals pass through a high-pass filter to an instrumentation amplifier and then through a second order band-pass filter. The filtered signals are sampled, digitised and loaded into data packets.

The system was validated in a benchmark study then validated \textit{in vivo} in an anaesthetised animal approved as a gastric dysmotility study model using serosal electrodes connected simultaneously to a commercial wired system.

Gastric slow wave activity resembles human gastric electrical activity in pattern and morphology. See figure 1 for an illustration of the system.

Benchtop tests demonstrated reliable communication within a distance range of 30 m, power consumption of 13.5 mW and 124 h operation when utilising a 560 mAh, 3 V battery. Analysis of the signals was performed using the Gastrointestinal Electrical Mapping Suite. \textit{In vivo} slow wave frequencies were recorded identically with the wireless (without signal distortion due to tissue absorption) and wired reference systems (2.4 cycles.min$^{-1}$), and automated activation time detection was modestly higher via the wireless system (463 vs 386 μV; $p < 0.001$).

The system had an acceptable band-pass response in the range of 0.05–0.3 Hz, which matched the design. The dominant slow wave frequency for the wired device, by fast-Fourier transform, was 0.04 Hz, identical to the wireless system.

This telemetric system for slow wave acquisition is reliable, power efficient, readily portable (it weighs just 20 g and measures $35 \times 35 \times 27$ mm$^3$) and potentially implantable. The device will enable chronic diagnostic monitoring and evaluation of slow wave patterns in animals and patients. With further miniaturisation and power consumption reduction to prolong battery life by application-specific integrated circuits and software programming of the wireless module, the device could be coupled to endoscopic recording electrodes, introduced into the patient’s stomach. This would allow routine minimally invasive patient recordings for several days in both fasted and fed states. The device can also provide multiple channels for spatial signal mapping in studies.

MORE INFORMATION
This work was recently published in the \textit{Physiol Meas} 2012; 33: N29–N37. http://dx.doi.org/10.1088/0967-3334/33/6/N29