

Editorial

Karl Friedrich Wilhelm Ludwig (1816-1895)

All physiologists and pharmacologists have used a kymograph (Gk. *kyma*, wave; *graphein*, to write) but probably not all know who invented it. The inventor was Karl Ludwig, "one of the greatest masters of physiology of modern times (1)". The kymograph places in the investigator's hands an invaluable aid for recording the magnitude as well as time course of a wide variety of physiological variables. The fundamental principle of converting time into distance has remained unchanged from the kymograph through polygraphs and oscilloscopes. Converting time into distance may not seem a big deal compared to the manipulations Einstein performed with time and space. But the humble kymograph has had an impact on physiology no less than the impact of relativity on physics. Besides the kymograph, the other technical advances introduced by Ludwig were the *Stromuhr*, a flowmeter employed in studies on circulation, a technique for estimation of blood gases, and the technique for perfusion of isolated organs. Ludwig was, however, much more than a 'blue collar' physiologist. His original contributions to knowledge covered a wide range: discovery of innervation of submaxillary glands, demonstration of salivary secretion in response to sympathetic stimulation, demonstration of ganglionic cells in the interauricular septum, and formulation of the filtration theory of renal function. Ludwig's still greater contribution was institution building. He founded a model physiological institute at Leipzig which he built up during the 30 years which he spent there. In his times, working at this institute was the dream of every physiologist. A disproportionately large number of Ludwig's pupils distinguished themselves and made enormous contributions to physiology. This was in no small measure due to the inspiring, dedicated and rigorous preceptorship which they received. As Sir William Osler wrote in 1884, "He (Ludwig) has the honour of having trained a larger number of physiologists than any other living teacher" (2).

Ludwig's qualities as a teacher are a good example for any teacher to emulate. He helped his students select worthwhile problems and lent them his rare capacity for zeroing in on the most significant and feasible questions for research. He helped conduct the experiments, often doing a considerable bit with his own hands. Every night he took home a bundle of protocols and research records so that the next day he could give his students his considered advice on the significance and interpretation of their observations and fruitful directions for further work. And, at the end of all this were several occasions when the work was published solely under the name of the younger colleague. To Ludwig, work was its own reward.

Karl Ludwig was, in short, a rare blend of exceptional intellect and remarkable character. He had a keen sense of logic and a talent for incisive analysis on one hand, and the gift of bright intuitive flashes on the other: an unusually balanced development of the two cerebral hemispheres. IJPP feels honoured in remembering Karl Friedrich Wilhelm Ludwig during the hundredth year of his passing away.

REFERENCES

1. Castiglioni A. A History of Medicine. (Krumbhaar EB, Transl & ED). New York: Alfred A Knopf. 2nd Edition. 1947:778.
2. Mettler CC. History of Medicine. (Mettler FA, Ed). Philadelphia: Blakiston, 1947:145.