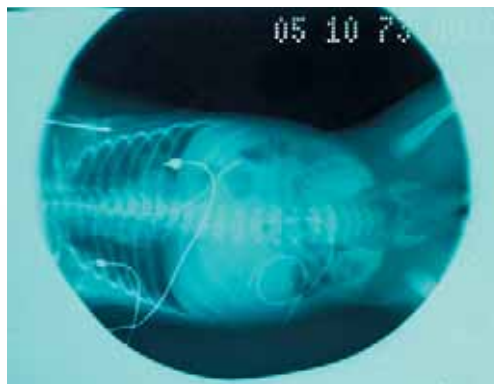


Pictured: An x-ray of a preterm infant wearing thin silver film electrodes. Only the wires show on the image.



Mike Neuman

Solving problems in clinical medicine

Mike Neuman joined Michigan Tech at a point in his career when some faculty might be considering retirement, but as he put it, he wanted to take on the challenge of helping to grow a young Department of Biomedical Engineering. An important part of this was helping newly hired faculty at the beginning of their careers to develop their individual research programs as well as to focus department research in two principal areas: biomaterials/tissue engineering and physiological measurement. It is in this latter area where his own research has been focused. In his forty-four years as an engineering and medical faculty member, Neuman has tried to address problems in clinical medicine by developing sensors and instrumentation that can help in diagnosing and monitoring patients in hospital and home settings, in a way that minimizes inconvenience and discomfort.

Neuman received his PhD from Case Institute of Technology in 1966 and afterwards taught electronics in Case's electrical engineering department. He developed a strong interest in medical electronics, which was a new field at the time. He was particularly intrigued by fetal monitoring, but he knew nothing about obstetrics. "My colleagues encouraged me," he said, "and asked me why I didn't go to medical school. So I did."

Neuman recalls an incident that happened during his medical training at Case Western Reserve University. "An x-ray was ordered for a preterm infant who had chest heartbeat and breathing sensing electrodes in place. These should have been removed before the image was made, since they cast shadows that interfere with interpretation of the film." A second x-ray had to be taken with the electrodes removed thereby exposing the infant to double the radiation. "I remembered my dissertation research studying the electrical and materials properties of thin metal films. I'd had difficulties assessing the crystal structure of the films—x-rays went right through them since they were so thin. This sparked the idea: Why not make infant sensors out of thin metal films so they would not have to be removed when an x-ray was needed?" Soon after Neuman made some new electrodes, and when x-rays were taken with these sensors in place, there was no disruption of the image.

Neuman extended his research in thin films, developing temperature and heat flux sensors. Small sensors placed at the base of the nose and over the mouth detect the temperature changes in inhaled and exhaled air during breathing and are used to detect individual breaths and pauses in breathing known as apnea. These sensors have become the basis of a commercial product used in apnea monitoring and sleep studies.

Today, Neuman's interest is in applying technology to address problems unique to rural health care. Through his work with Portage Health in Hancock he is getting Michigan Tech students working on practical problems through senior design projects, Enterprise, and undergraduate student research projects in his lab. These projects include: an instrument to measure capillary refill time; a simple, miniature infant heartbeat annunciator; a device to indicate when joint replacement surgery patients are at risk of falling during rehabilitation on a treadmill; and many others. "Michigan Tech is in a great position to develop instruments and devices to improve rural health care based on location and a strong collaboration with Portage Health," says Neuman. "I plan to devote the next few years to doing just that."

Neuman has served as editor of *IEEE Transactions on Biomedical Engineering* as well as the British journal *Physiological Measurement*. He is currently the editor of *IEEE Pulse*.