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## Biomedical Acoustics Laboratory

Overlapping Research and Development Foci:

- **Modeling:** simulating the acoustic generation and transmission properties of biological tissues and organs in health and disease
- **Measurements:** detecting and processing low-level biological acoustic signals to extract physiologic or diagnostic information
- **Device Design:** developing novel clinical sensors or instruments for noninvasive diagnosis, monitoring, or therapy based on acoustic principles

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## Example Research Projects

Detection of Respiration via Sounds Transmitted to the Ear Canal

- Development of a breathing detection and monitoring system via respiratory sound detection in the ear canal – a relatively unobtrusive measurement site
- Potential uses include exercise, activity, and sleep apnea monitoring

Selected reference:

Pressler, G.A., Mansfield, J.P., Pasterkamp, H., and Wodicka, G.R., "Detection of respiratory sounds at the external ear," *IEEE Transactions on Biomedical Engineering*, 51(12): 1069-1076, 2004.



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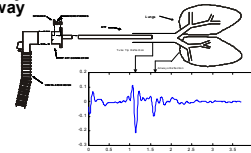
## Example Research Projects (cont.)

Breathing Tube Guidance System

- Many patients require accurate breathing tube placement and position monitoring for ventilatory assistance
- Guidance system introduces sonic pulses into tube and airways and analyzes the echoes that propagate back up the tube
- The presence, timing, and polarity of echoes determine tube patency and location in the airway

Selected reference:

Juan, E.J., Mansfield, J.P., and Wodicka, G.R., "Miniature acoustic guidance system for endotracheal tubes," *IEEE Transactions on Biomedical Engineering*, 49(6): 584-596, 2002.



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## Some Current Research Efforts

- Modeling and Measurement of the Acoustic Properties of Liquid-Filled Tubes
- Estimation of Air Flow Rate from Respiratory Sounds Transmitted to the Ear Canal
- Development and Evaluation of Bioacoustic Sensors
- Effect of Subglottal System on Vocal Fold Dynamics in Speech Production

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