Short Wave Infrared Endoscope  
Technology #17529  

Applications  
This invention is an optical device which uses shortwave infrared light to detect middle ear pathologies.

Problem Addressed  
Studies have shown that about 8 million children in the U.S each year are diagnosed with otitis media, the medical term encompassing middle ear infections. A clear diagnostic sign of a middle ear infection is the buildup of fluid behind the ear drum. Reliably identifying the presence of middle ear fluid can be challenging in a pediatric patient. Commonly used methods such as pneumotoscopy are highly operator-dependent and can suffer both in sensitivity and specificity even in the hands of an experienced practitioner. The development of an otoscope sensitive to shortwave infrared light would enable better contrast of fluid in an image of the ear, potentially resulting in more reliable fluid identification during an ear examination.

Technology  
The inventors have developed a Short Wavelength Infrared (SWIR) otoscope which could improve doctors’ ability to diagnose middle ear infections. This device is composed of a light source, a SWIR camera, and a medical viewing instrument, such as an otoscope or an endoscope. The advantage of using SWIR light is the easier detection of middle ear fluid based on its strong light absorption. Additionally, the shortwave infrared light can penetrate deeper within the tissue, enabling better visualization of the middle ear through the tympanic membrane. Using a SWIR otoscope, the middle ear with the presence of otitis media with effusion will become completely dark allowing for easy differentiation between the presence or absence of the middle ear fluid. In addition, under conditions of no otitis media, the SWIR otoscope is able to visualize in great detail the ossicular chain of the middle ear. This detail, which is obstructed by the tympanic membrane in visible and near-infrared imaging techniques, can allow an examiner to rule out ossicular chain disruptions.

Advantages  
- Reliably identifies the presence of middle ear fluid in a patient  
- Greater transparency of the ear drum enables clear visualization of underlying middle ear anatomy  
- Add-on device that can be used with currently used otoscopes and endoscopes

Categories For This Invention:  
Medical Devices  
Diagnostic  
Photonics
Other (Photonics)
Life Sciences
Clinical Applications
Ear, Nose, & Throat
Pediatrics
Imaging
Instrumentation

**Intellectual Property:**
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Systems and methods for a short wave infrared device
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**Publications:**
Using the Shortwave Infrared to Image Middle Ear Pathologies
Proceedings of the National Academy of Sciences
September 6, 2016
A New Eye on the Middle Ear
MIT News
August 22, 2016
MIT Unveils Short-Wave Infrared Otoscope for New View of Middle Ear
med Gadget
August 26, 2016

**External Links:**
Bawendi Group
http://nanocluster.mit.edu/research.php

**Image Gallery:**