

My first Around the World trip was in 2005 ☺

Washington, DC AdCom Meeting as 2005 IEEE AP-S President and then on to EPFL

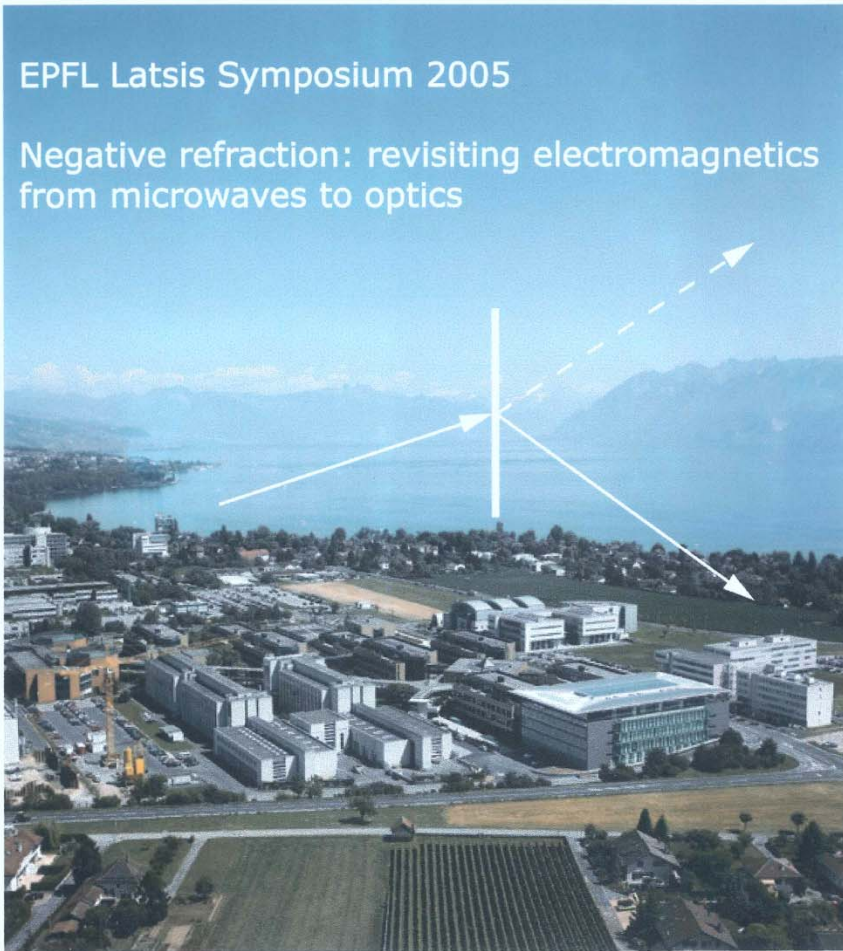
Richard W. ZIOLKOWSKI

University of Arizona

USA

EPFL Latsis Symposium 2005

Negative refraction: revisiting electromagnetics
from microwaves to optics



And then on to the first iWAT meeting



iWAT 2005

**2005 IEEE International Workshop
on Antenna Technology :**

Small antennas, novel metamaterials

Marina Mandarin Hotel

Singapore

March 7-9, 2005

At the Latsis meeting, I was told:

Dear Rick:

The idea of metamaterial-based antennas
is

META-IMPOSSIBLE !!!!!

It was important to be Meta-Positive !!

Quite fortunate that many of us have been able to prove the nay-sayers wrong ☺

Applications of Metamaterials to Realize Efficient Electrically Small Antennas

iWAT 2005

Singapore

March 2005

Metamaterials have a number of potential applications for antenna systems

- Artificial magnetic conductors (**AMCs**)
- Zero-index medium for highly directional beams
- Dipole antenna / DNG and ENG shell systems to realize efficient electrically small antennas (**EESAs**)
- **MORE TO EXPLORE**

Summary slide of my 2005 iWAT presentation



The Future of Metamaterials-Antennas

I remain
Doubly Positive 😊
about
MTM-inspired Constructs
and
Their Applications to Antenna Technologies



Companies ARE using our meta-structures



New Ways of thinking about old problems !!



Additional frequency regimes to explore
mmW, THz, IR, optical



Integration with other physical waves:
EM-Phononics, EM-Photonics

MANY -- Nano Antenna / MTM-inspired Structures -- Applications

I concur with the other panel members:

We need to be explicit about what aspect of metamaterials we are using when we report our results

My preferred terminology:

Metamaterial: artificial material with properties that can be tailored to an application

This is an all inclusive selection – *any* bulk artificial material

Meta-surface: a single layer of metamaterial elements/unit cells

Metamaterial-inspired: using some aspect of metamaterial design for an application

Meta-structure: some form of metamaterial-inspired platform

Note: Many communities insist that metamaterials be considered to be artificial structures that have their unit cells much smaller than a wavelength in order that homogenized material properties can be invoked

This limitation separates metamaterials from electromagnetic band-gap structures, i.e., periodic structures which need some multiple of half a wavelength between their elements to achieve their properties