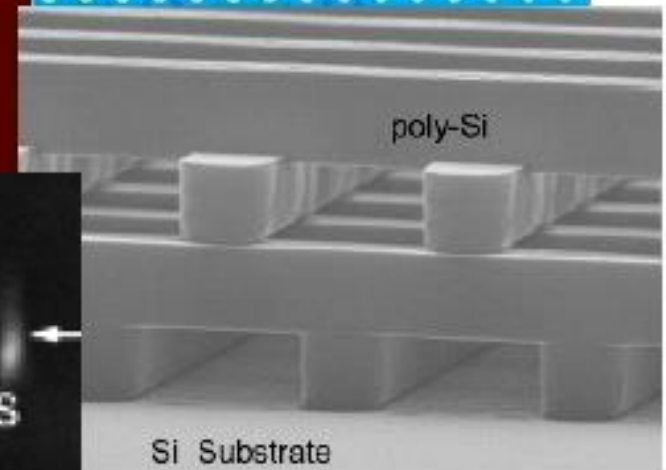
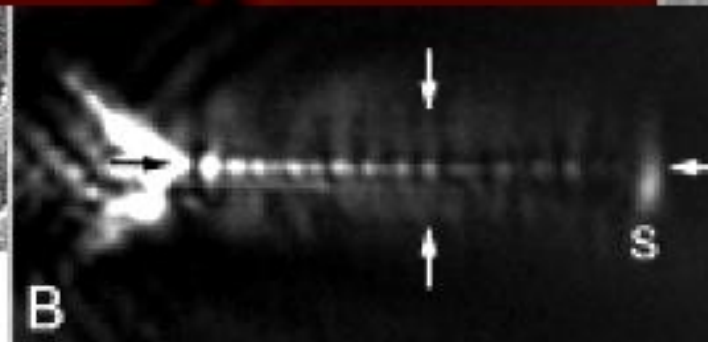
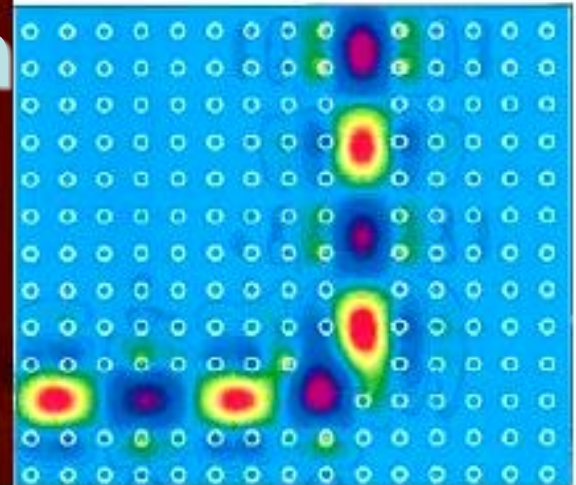
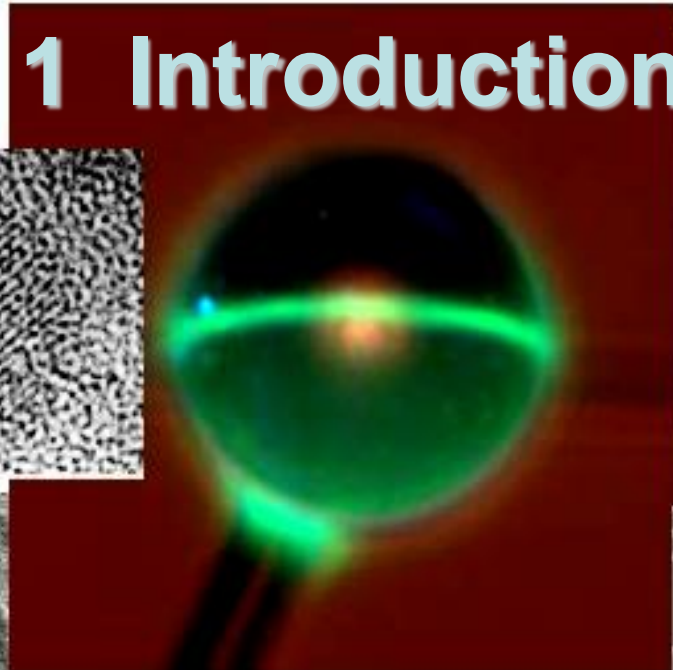
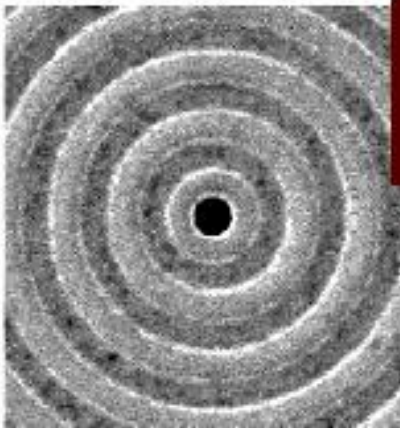
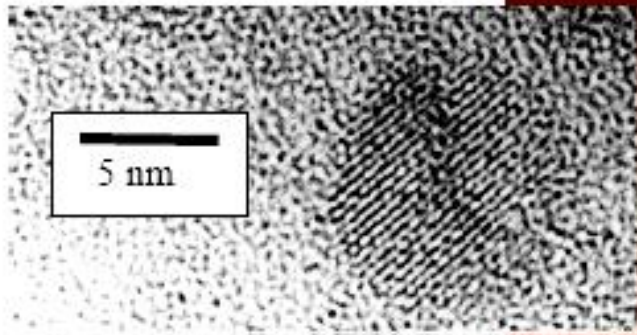


# Nano-optics

Credit:2

Teacher: Prof.Dr./ Yongqi Fu/Stephen

## 1 Introduction





# Teaching Methodology

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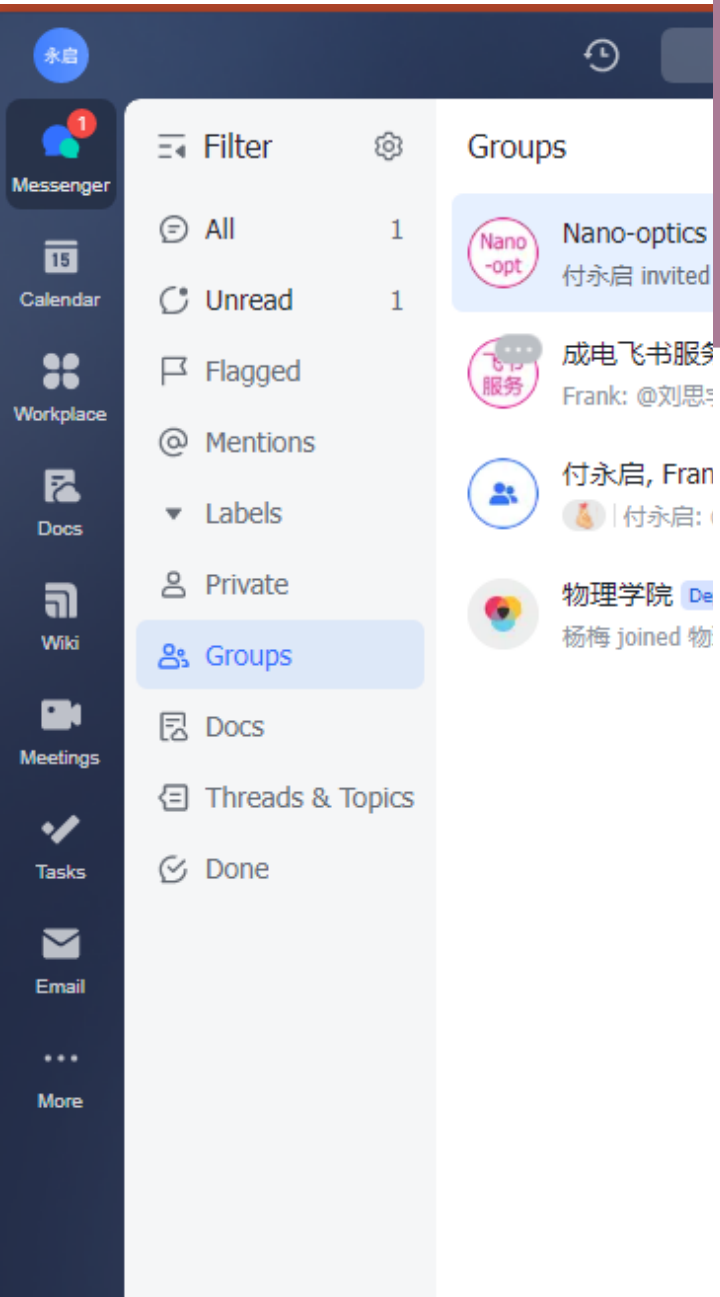
**Class presents itself as overview of area with basic coverage of related fundamentals.**

**The textbook has been designed around the pre-existing structure of the class.**

**Class lectures designed as support of your independent reading, and explain the bigger picture of such research.**

**Note:** attendance is NOT optional

**Online teaching APP: Lark**



Nano-optics  
电子科技大学



Only members of this organization can join this  
group

This QR code is valid for 7 days (before 2/22)

<https://www.feishu.cn/calendar/share?token=338fd669effa823ec8c47312c288cc30>

# Nano-optics

Monday, Feb 27, 1:00 - 2:35 PM (GMT-8)

Weekly, until May 1, 2023



永启

付永启

Organizer



Scan QR code to join the event on Feishu



<https://www.feishu.cn/calendar/share?token=2826de389df394125b4ce0ae1e8e64b2>

# Nano-optics

Wednesday, Mar 1, 1:00 - 2:35 PM (GMT-8)

Weekly, until May 1, 2023



永启

付永启

Organizer



Scan QR code to join the event on Feishu



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Feb 2023

Day

Week

Month

Sun Mon Tue Wed Thu Fri Sat

29 30 31 1 2 3 4

5 6 7 8 9 10 11

12 13 14 15 16 17 18

19 20 21 22 23 24 25

26 27 28 1 2 3 4

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GMT-8

Sun 26

Mon 27

Tue 28

Wed 1

Thu 2

Fri 3

Sat 4

9 AM

10 AM

11 AM

12 PM

1 PM

2 PM

3 PM

4 PM

5 PM

亚波长光学

10:20 - 11:55 AM

亚波长光学

10:20 - 11:55 AM

Nano-optics

1 - 2:35 PM

Nano-optics

1 - 2:35 PM

**Time schedule of the course**

6



# Evaluation

---

**Final score= paper test (100%)**

Test paper will be uploaded to:

**“Nano-optics” group in Lark**

Please send the completed test paper to my email box: **[yqfu@uetc.edu.cn](mailto:yqfu@uetc.edu.cn)**

# Subwavelength Optics Theory and Techno

eISBN: 978-1-60805-050-5  
doi: 10.2174/97816080505051090101

All E-Books

Volume: 1

▶ View Chapters

Key: **N** New Content **F** Free Content **O** Open Access

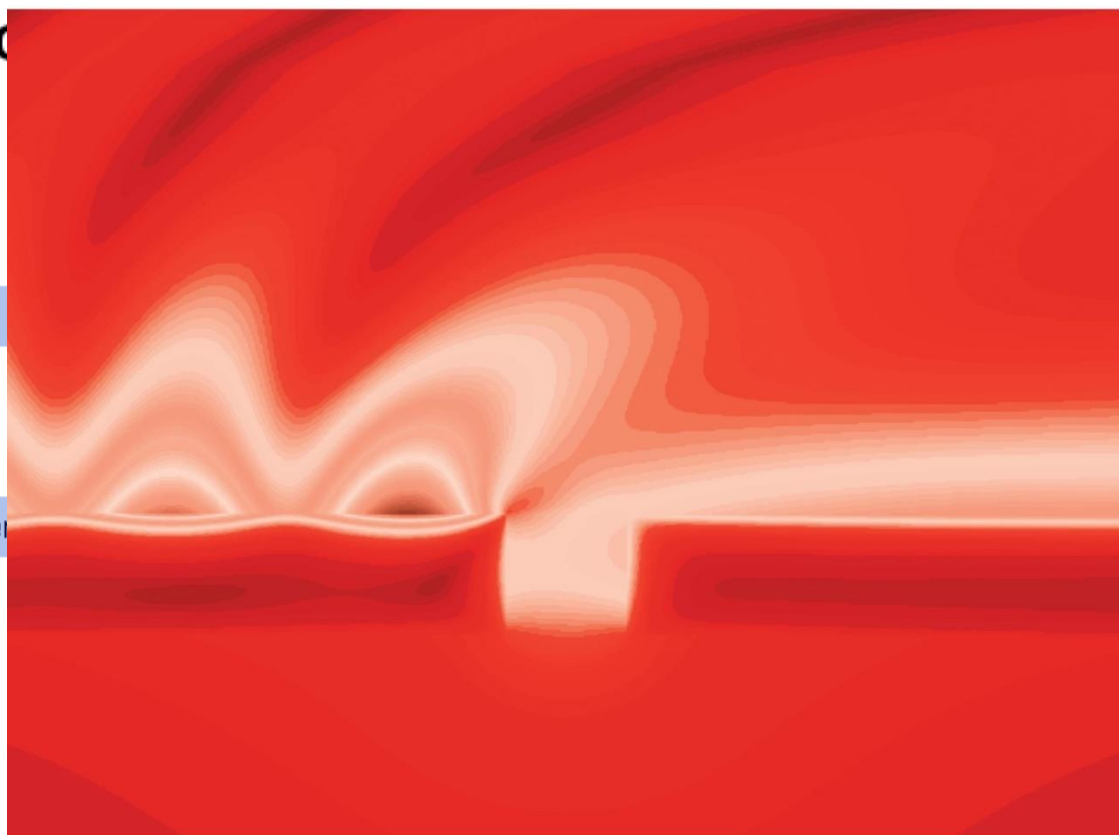
**Bentham Science Publishers**  
[www.bentham.org/ebooks](http://www.bentham.org/ebooks)



ISBN: 978-1-60805-050-5

# Subwavelength Optics

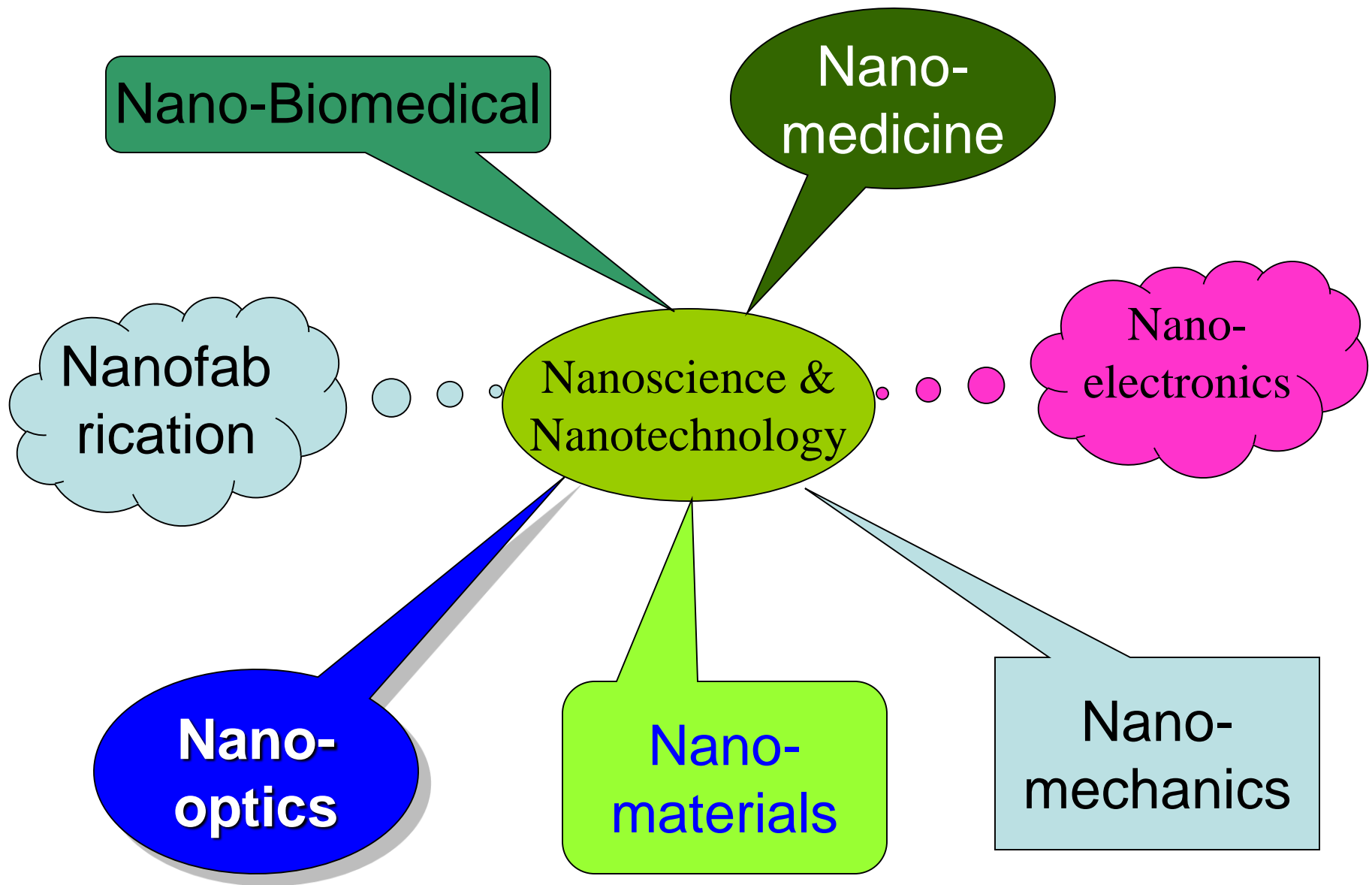
## Theory and Technology



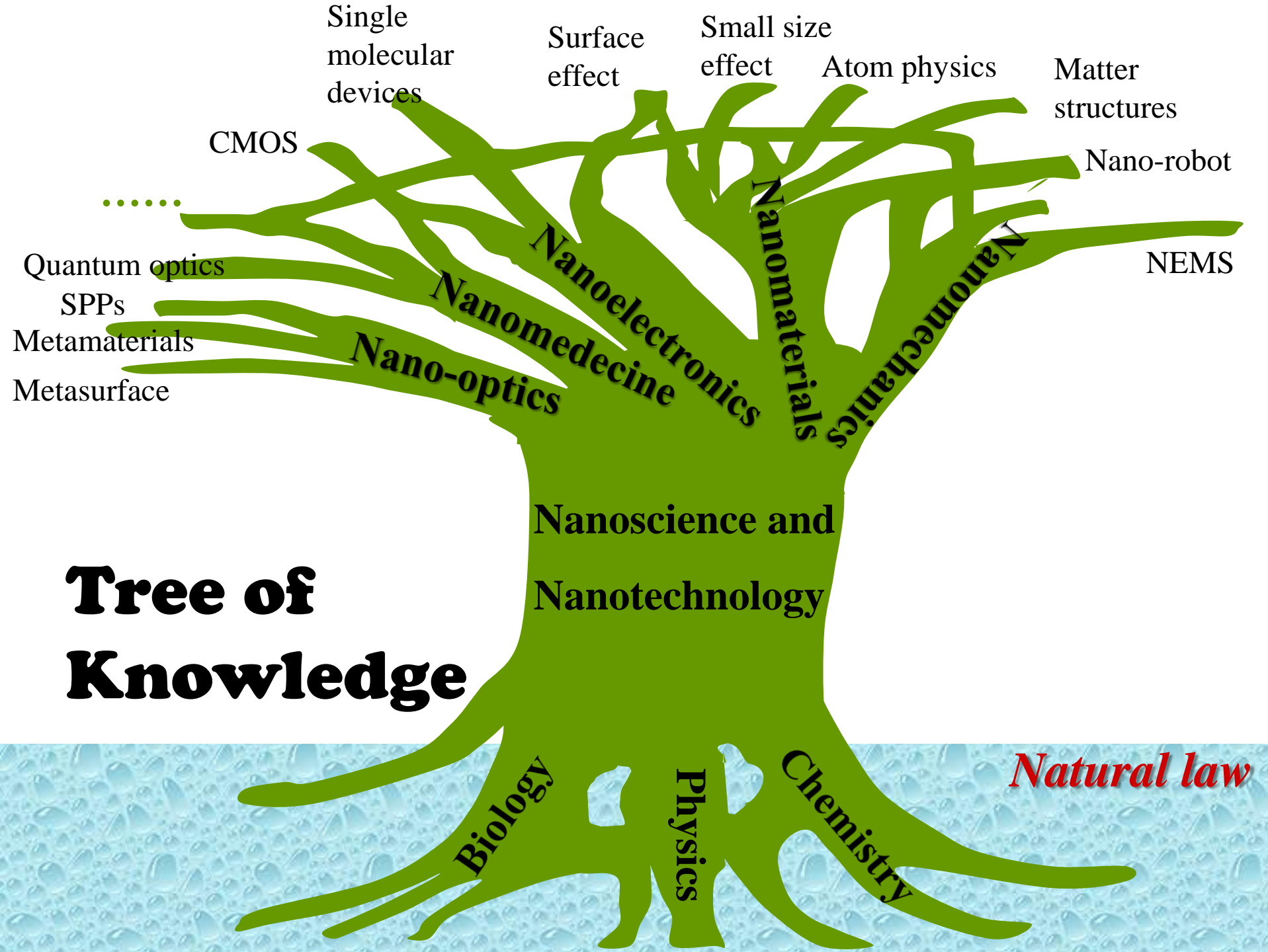
**Author:** Yongqi Fu

**Bentham**  **Books**

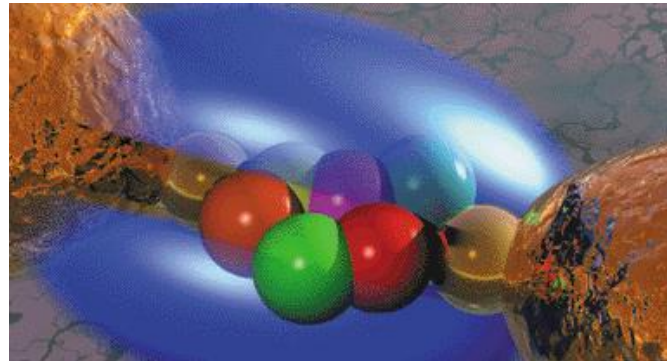
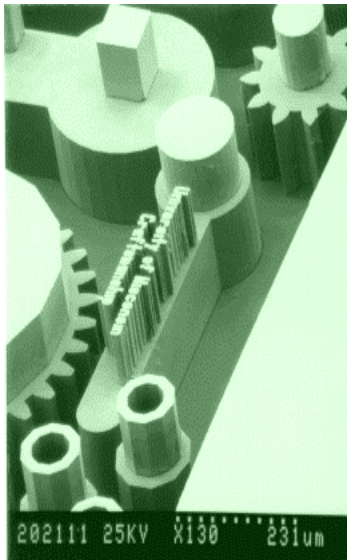
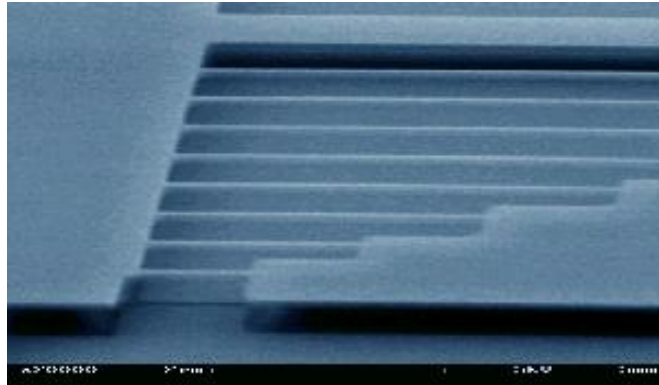
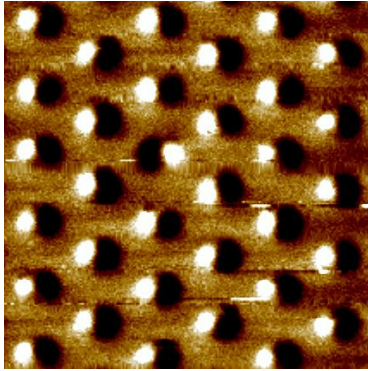




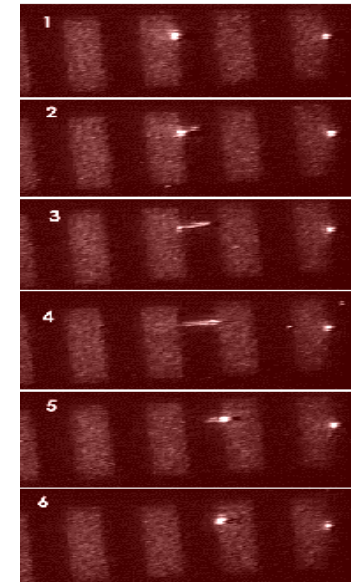
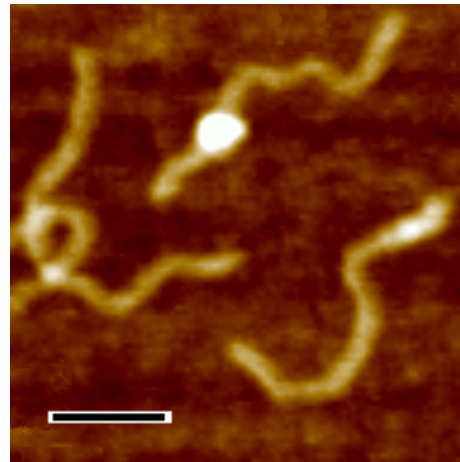
# Tree of Knowledge

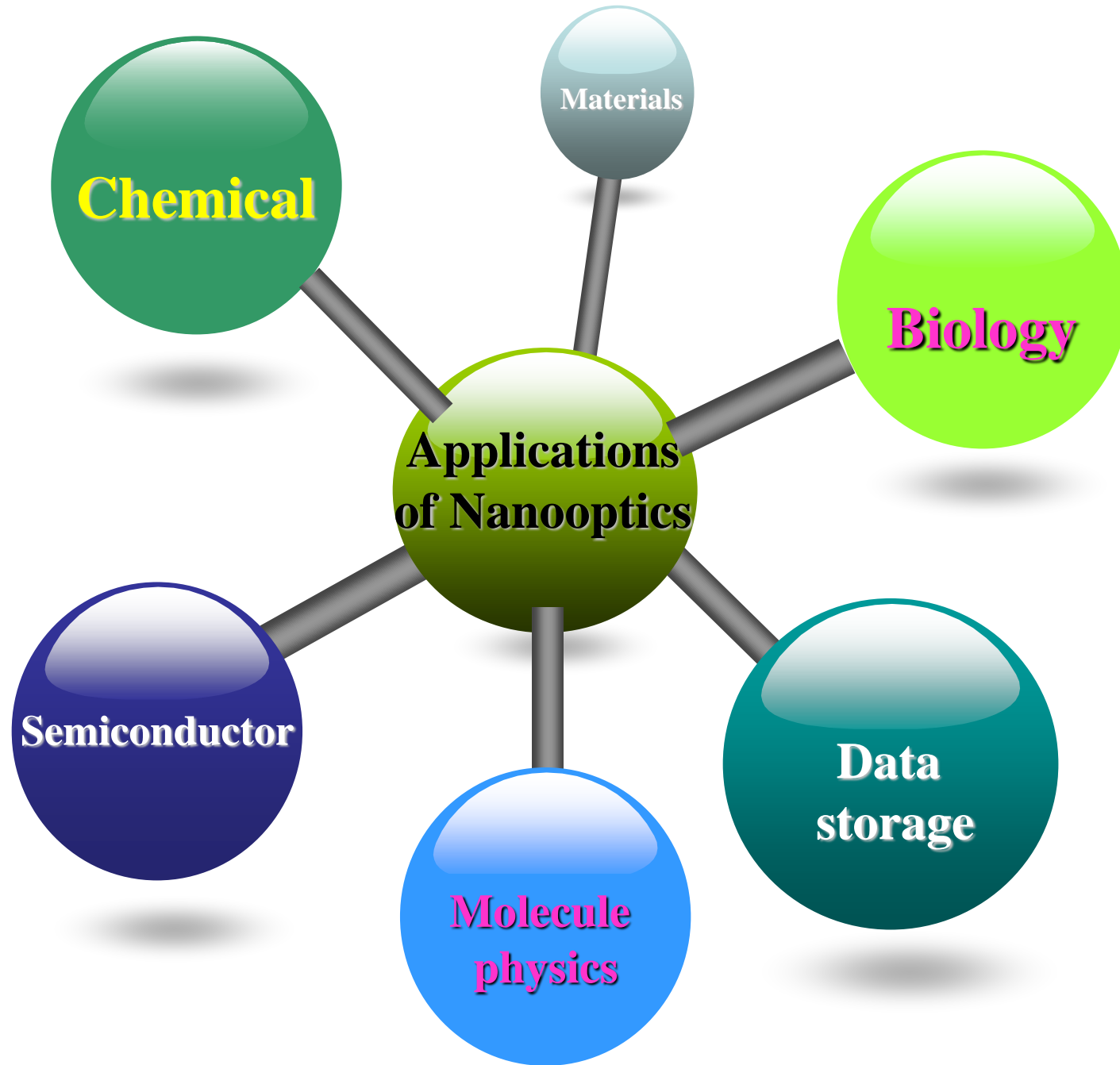


# Nanoscience and Nanotechnology

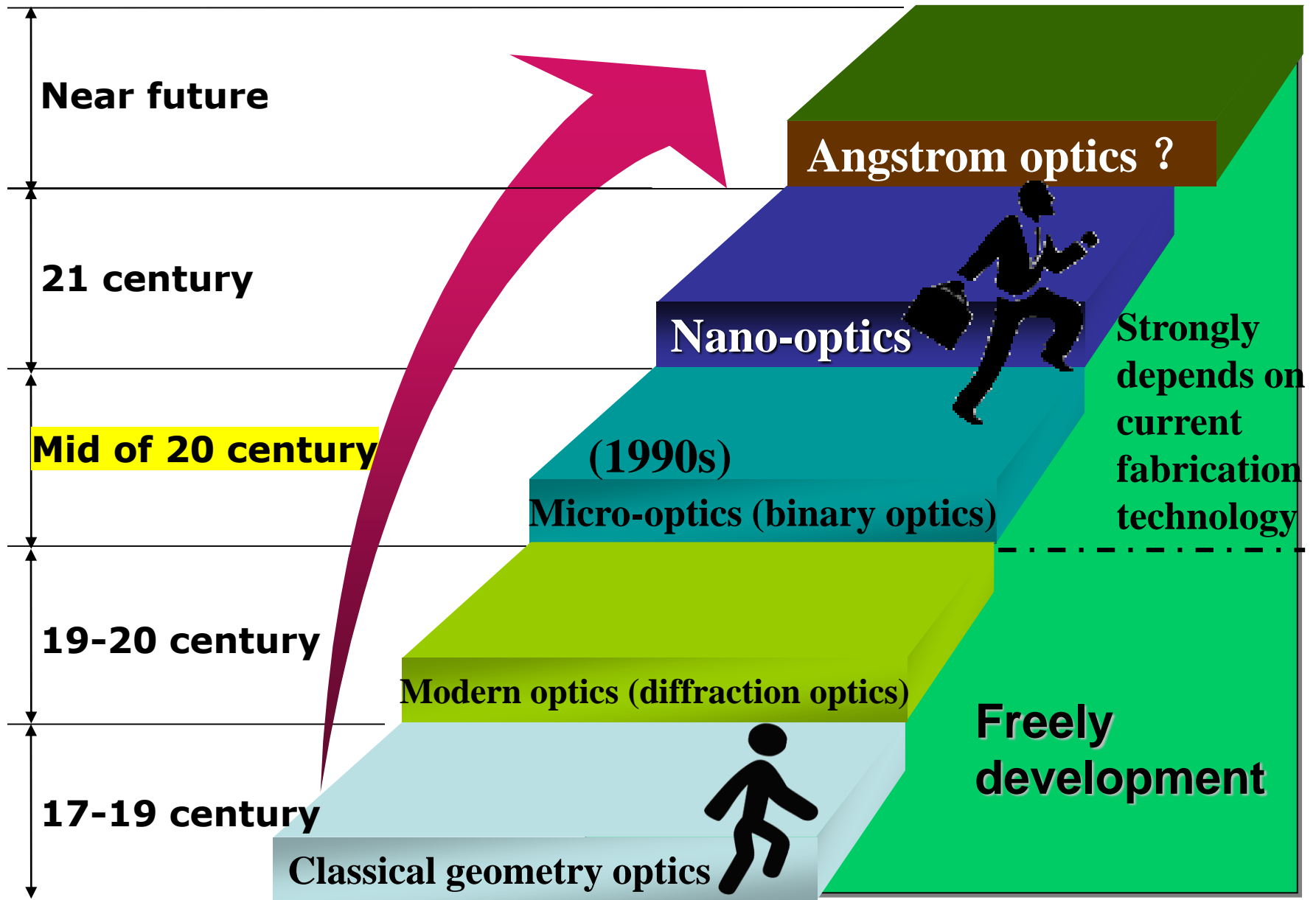


nm





# Evolution of Nano-optics



	Before Mid of 20 Century	After Mid of 20 Century
<b>Funding issue</b>	Funding is financed from noblemen. Researchers are no need to worry about their funding. They can completely focus on their research.	Funding is supported by government or those enterprises. Researchers need to apply for funding according to their demanding.
<b>Requirements</b>	No any requirement from noblemen. Researchers can do whatever they want and interested. It is a freely style researching in relaxing environment.	Requirement from government or enterprises is high and concrete with definite target after finish the projects.

<b>chapter</b>	<b>Title</b>	<b>Teaching hours</b>
1	Introduction	2
2	Electromagnetic field and surface plasmons	4
3	Wave propagation through subwavelength metallic structures and numerical algorithms	4
4	Near-field microscopy and applications	2
5	Metamaterials	4
6	Top-down fabrication techniques	6
7	Bottom-up fabrication technique	2

<b>chapter</b>	<b>Title</b>	<b>Teaching hours</b>
8	Characterizations	8
9	Nanoholes array and applications	2
10	SPP imaging and superfocusing	4
11	Metallic nanoparticles array for biosensing	2
12	Plasmonic lasers	Self-learn
13	Metamaterials-based antennas	Self-learn
14	Plasmonic structures for data storage	Self-learn
15	Photonic crystals	Self-learn
16	Quantum dots/Future prospects and challenges	Self-learn
<b>Total hours</b>		<b>40</b>



**Briefly introduce principal topics for each chapter**

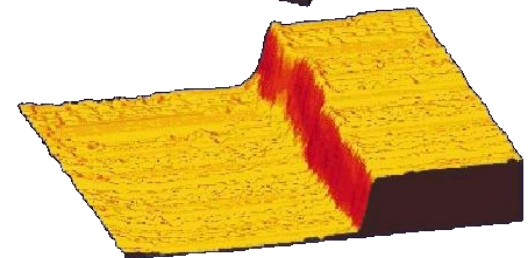
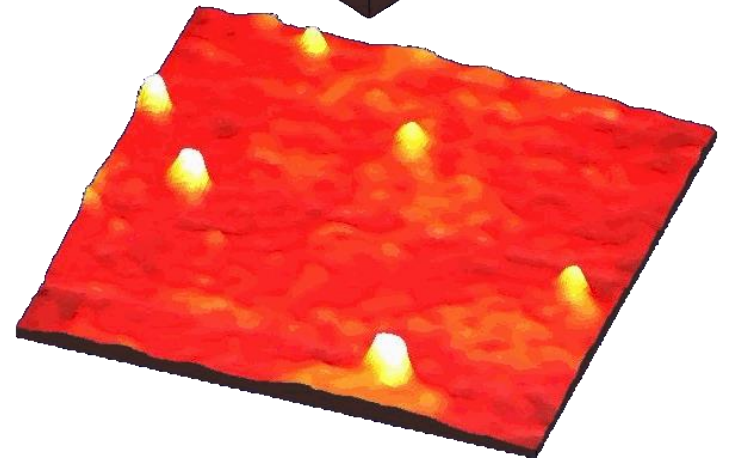
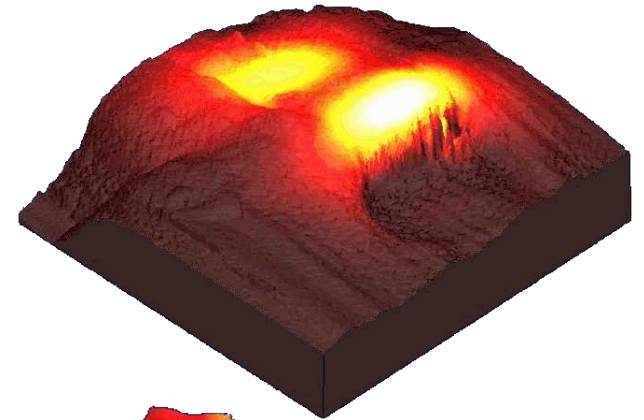
# Chapters 2

- Electromagnetic theory and Maxwell equations
- Metal optics
  - ✓ Dielectric constant of metals
  - ✓ Surface plasmon polaritons (SPPs)

# Chapters 3

- **Rigorous coupling wave analysis (RCWA)**
- **Numerical computational algorithms:**
  - ✓ **Finite difference and time domain (FDTD)**
  - ✓ **Discrete dipole approximation (DDA)**

# 4 Near-field scanning optical microscope (NSOM/SNOM)



# 5 Negative refraction index/Left-hand materials/Metamaterials



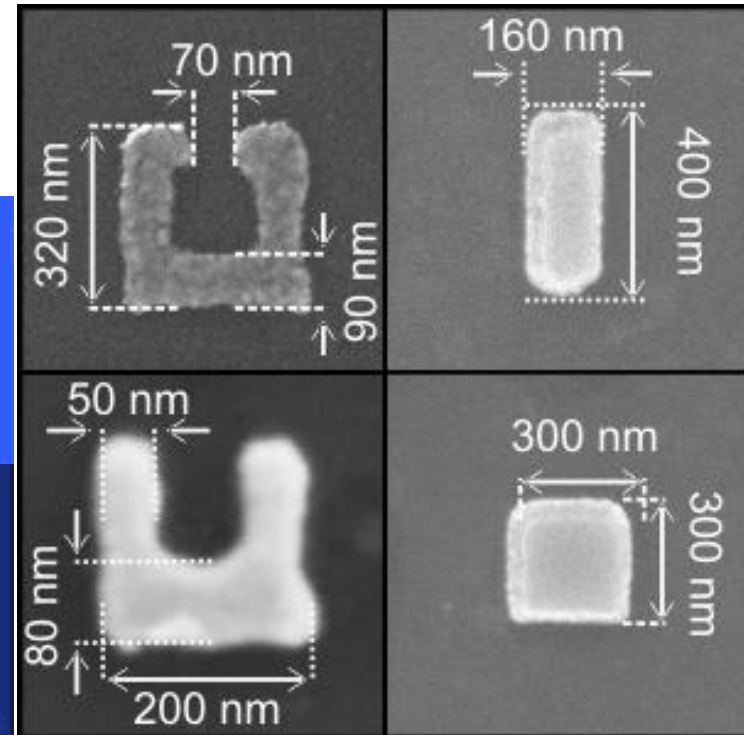
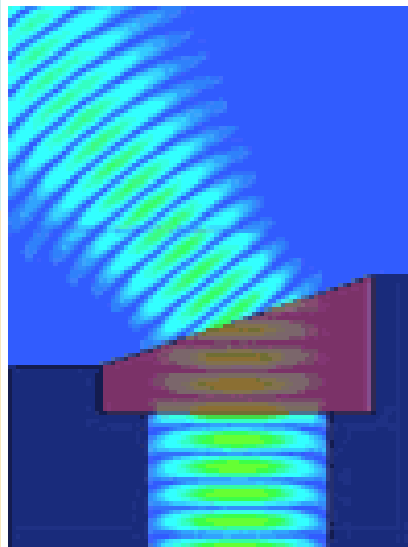
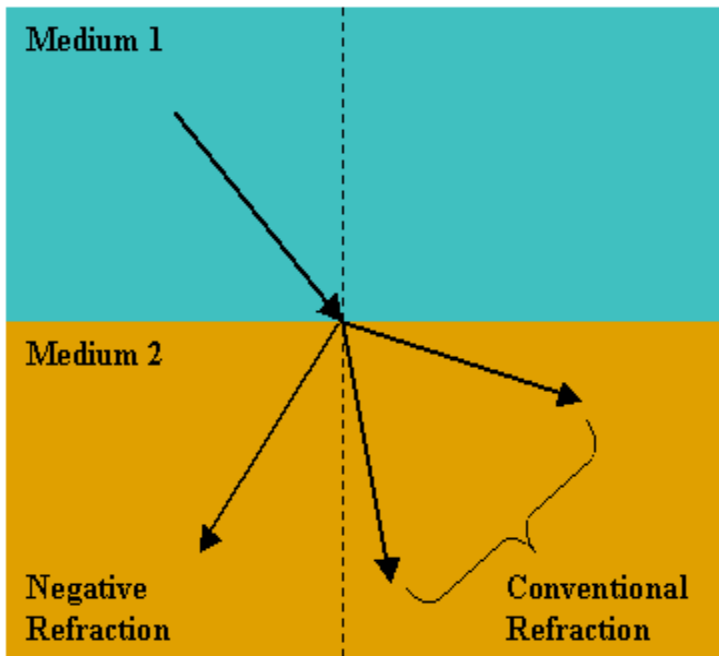
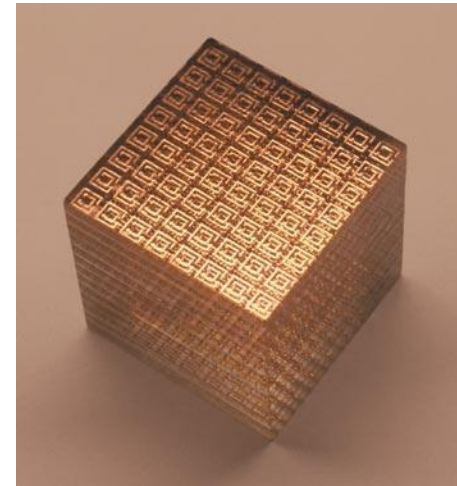
(a)



(b)

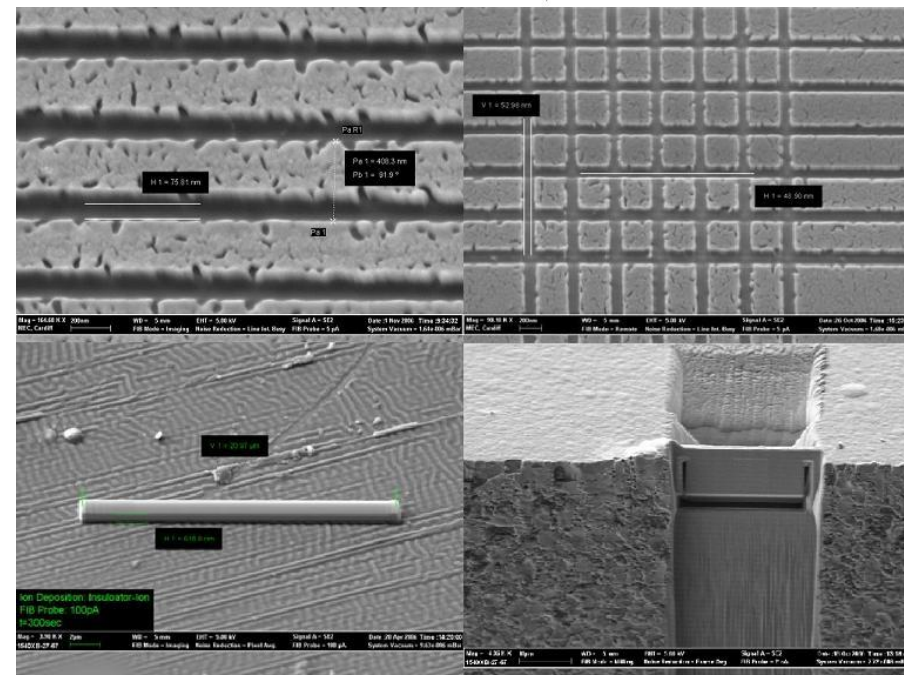
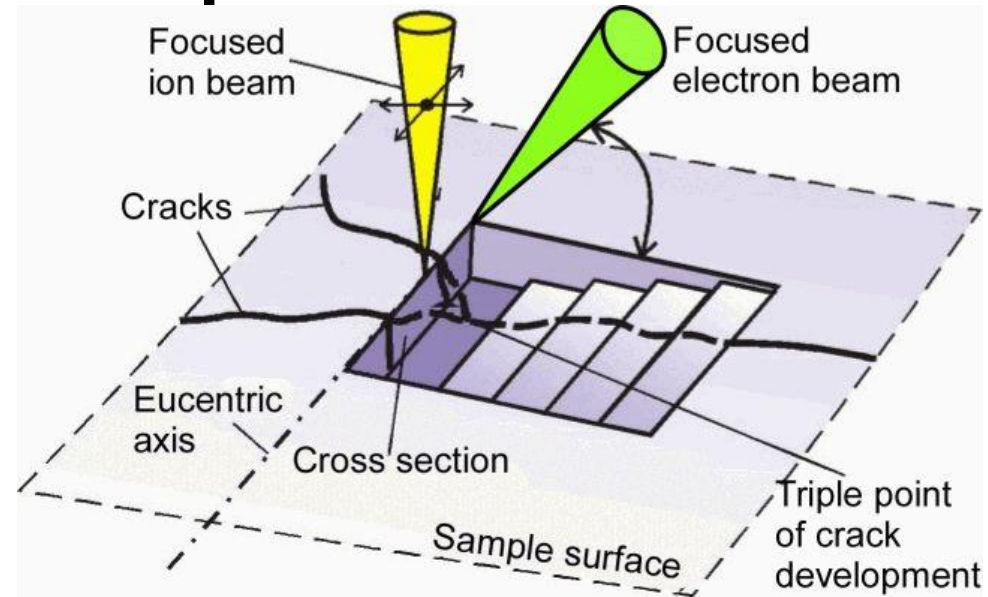
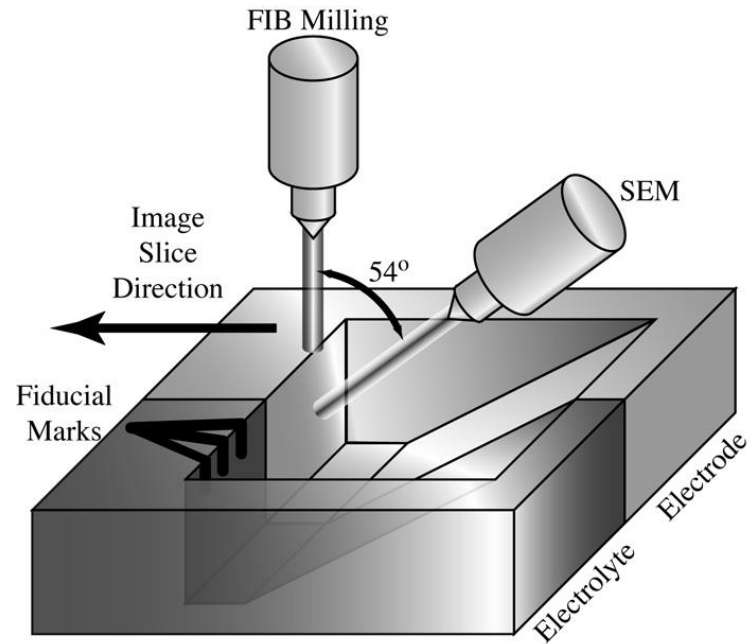


(c)





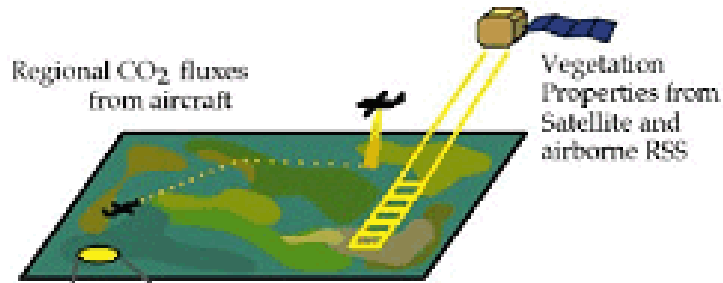
# 6 Fabrication techniques I: Top-down fabrications



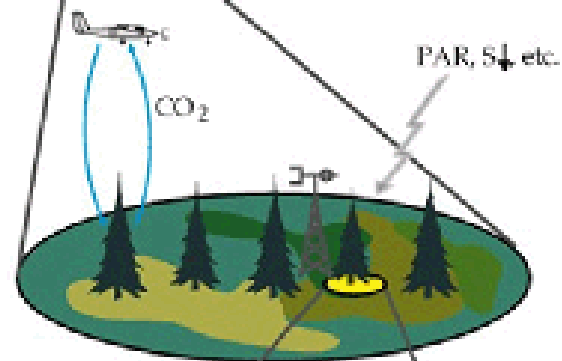
# 7 Fabrication techniques II: Bottom-up fabrications

## Bottom-Up Scaling Approach

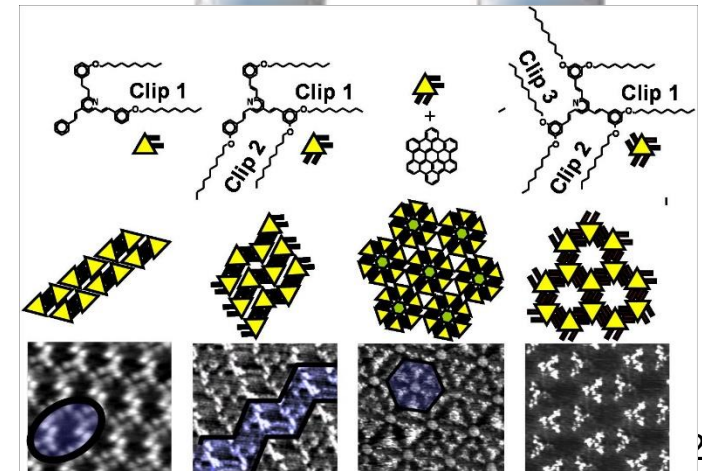
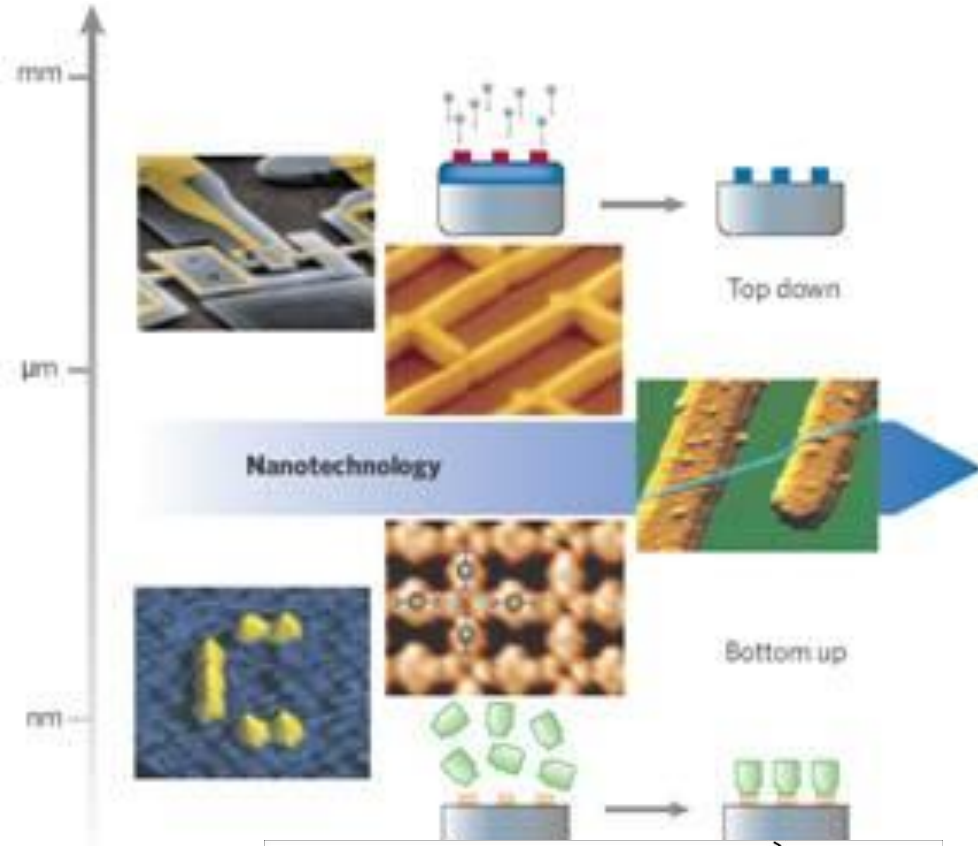
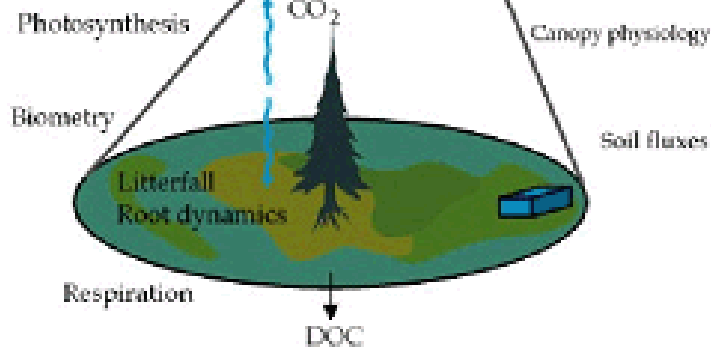
Regional Scale



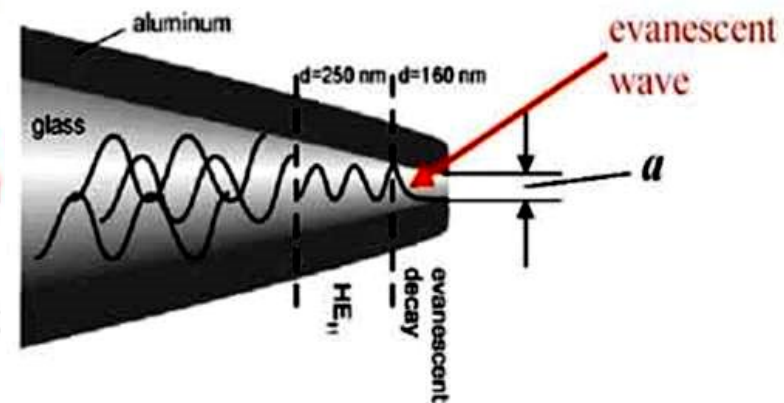
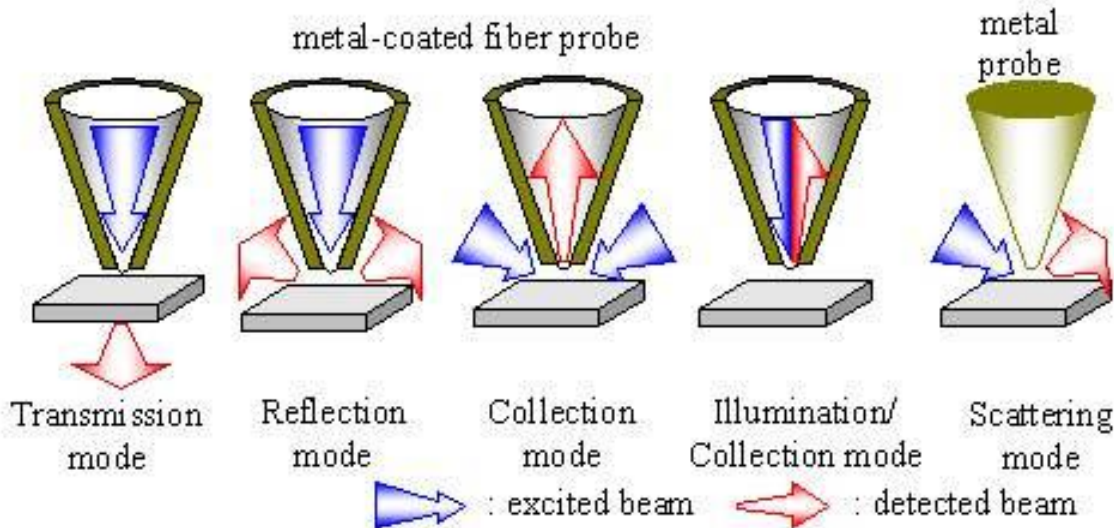
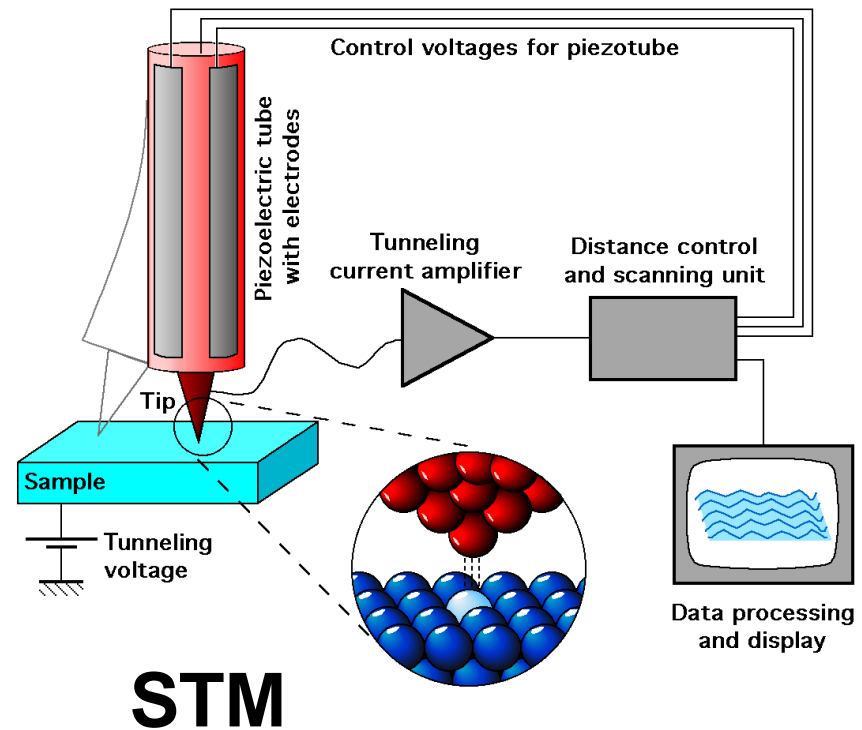
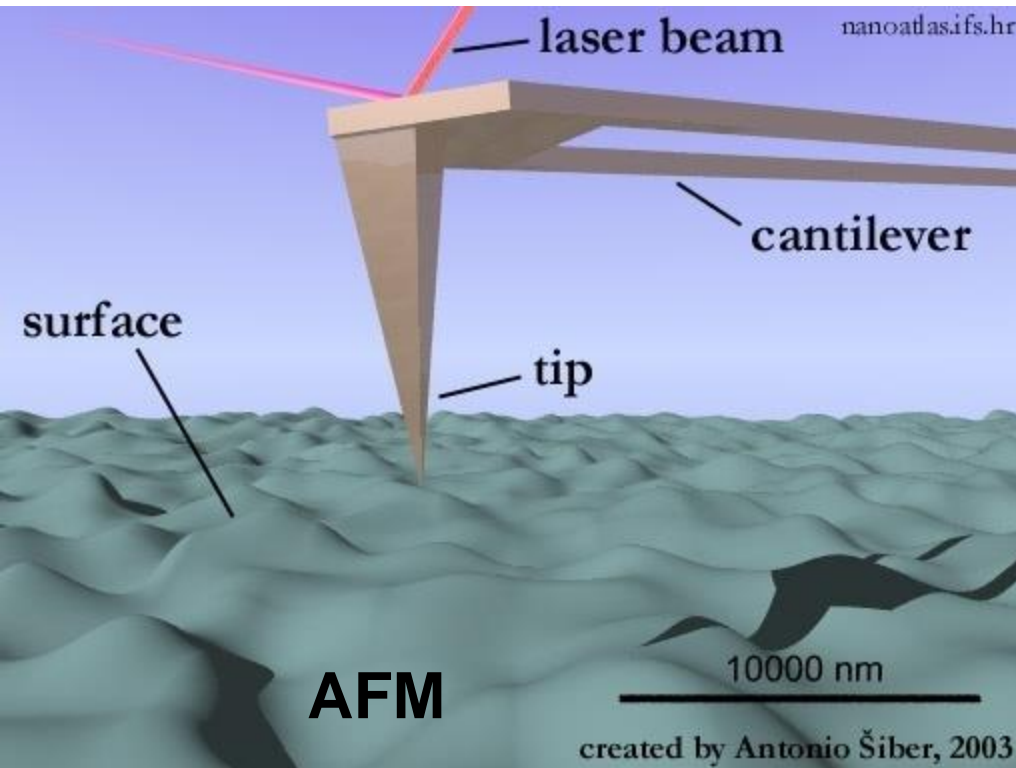
Local Scale



Plot Scale

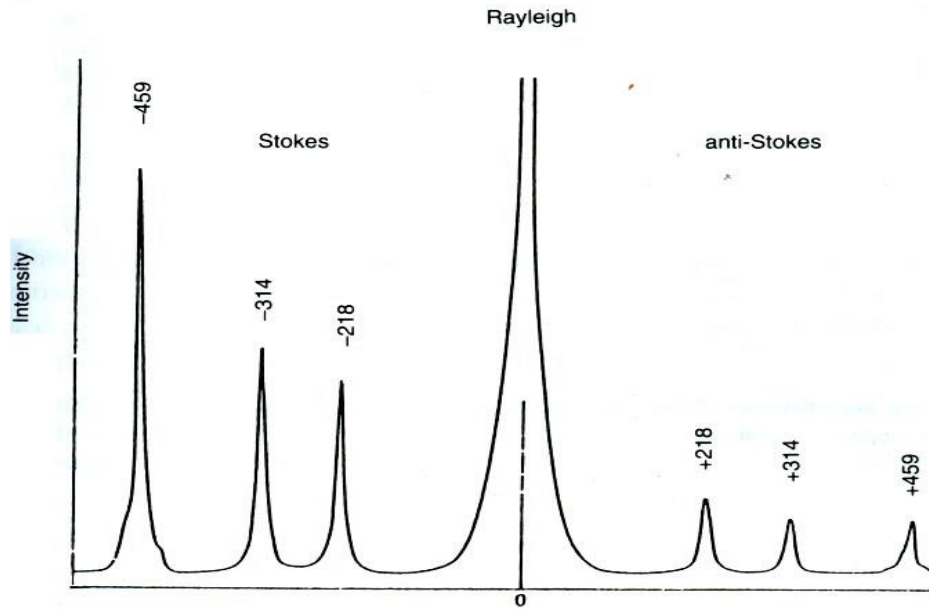


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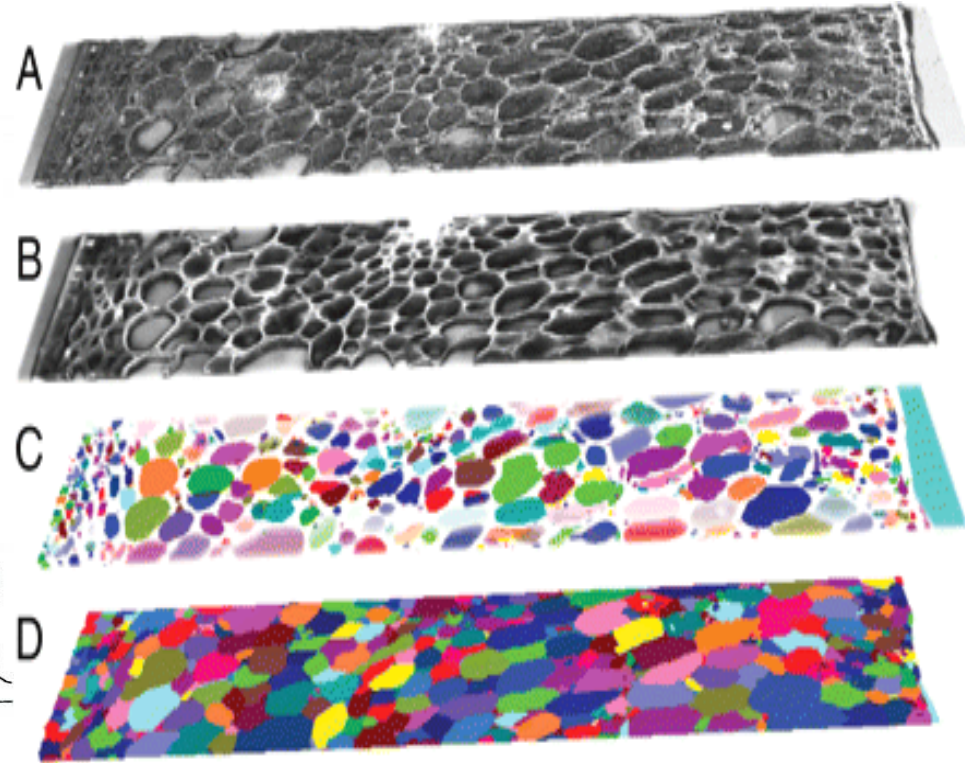




# 8 Characterization of plasmonic nanodevices

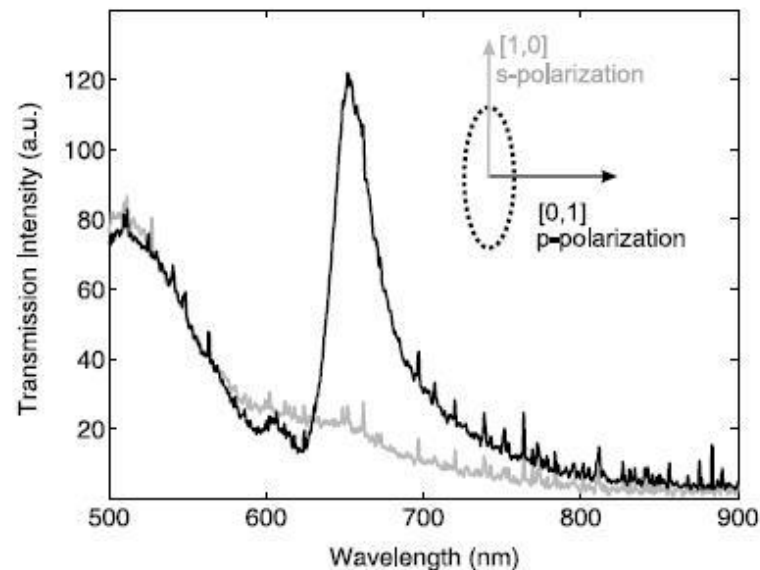
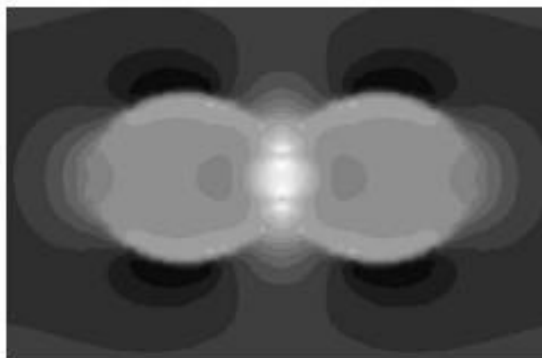
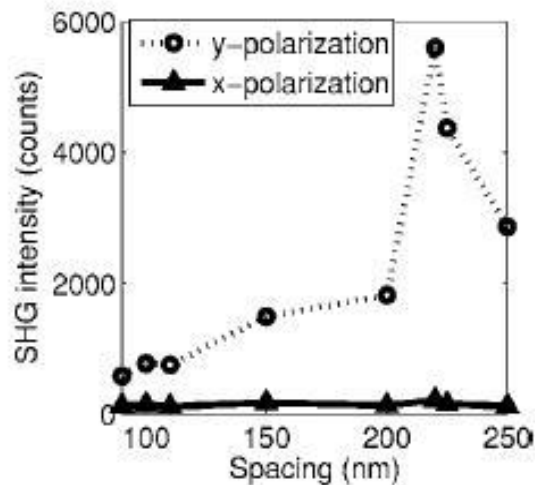
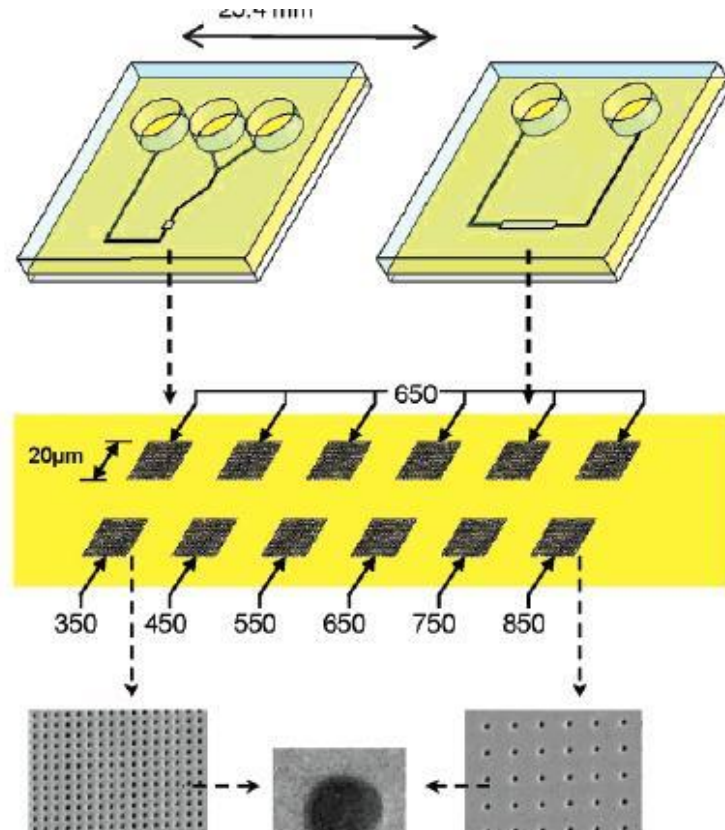
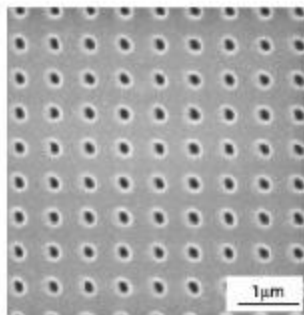
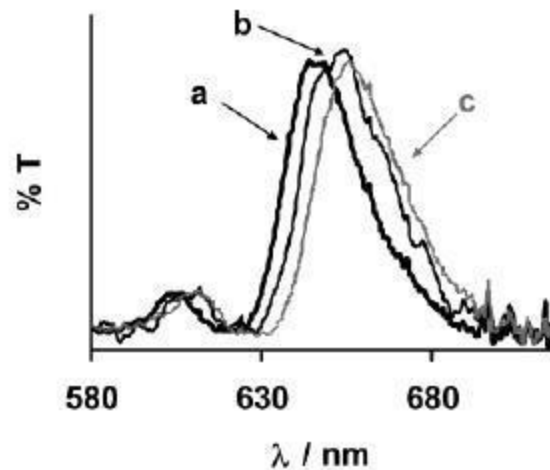


Raman spectroscopy



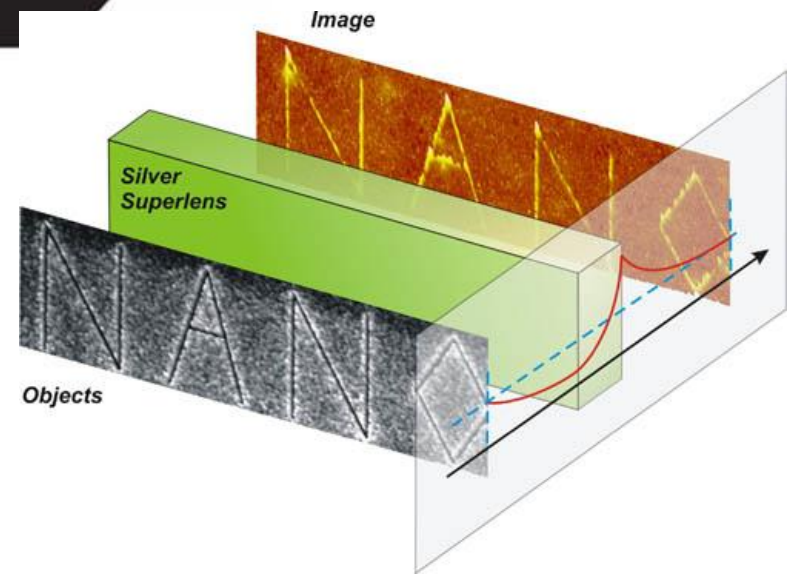
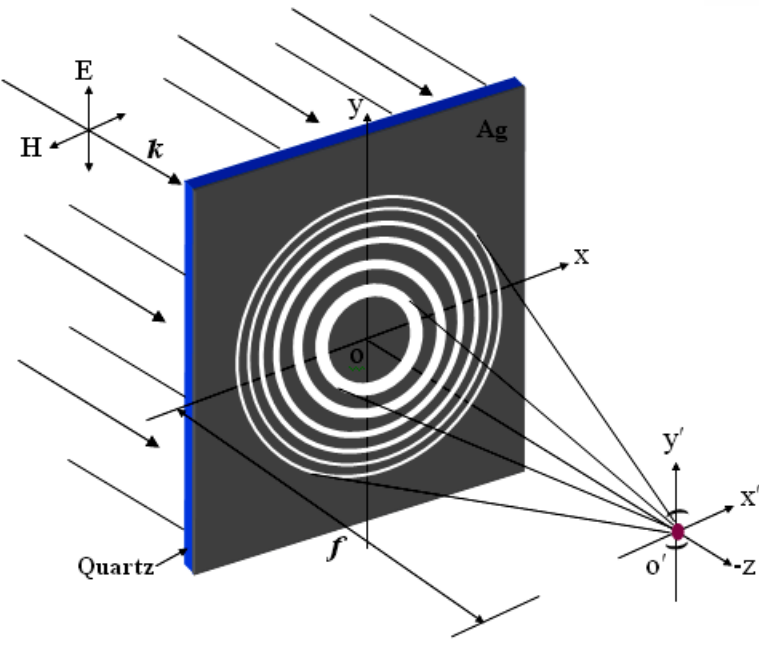
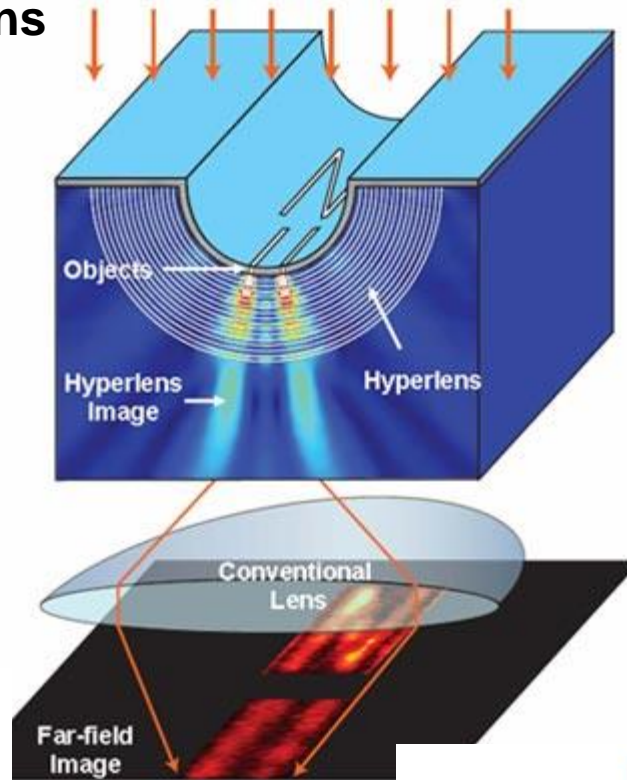
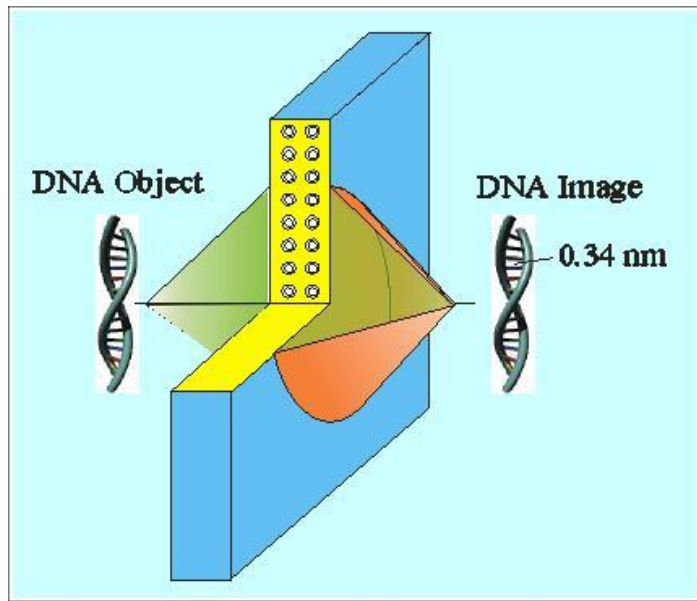
Optical microscopy

# 9 Nanohole-based polarization effect analysis



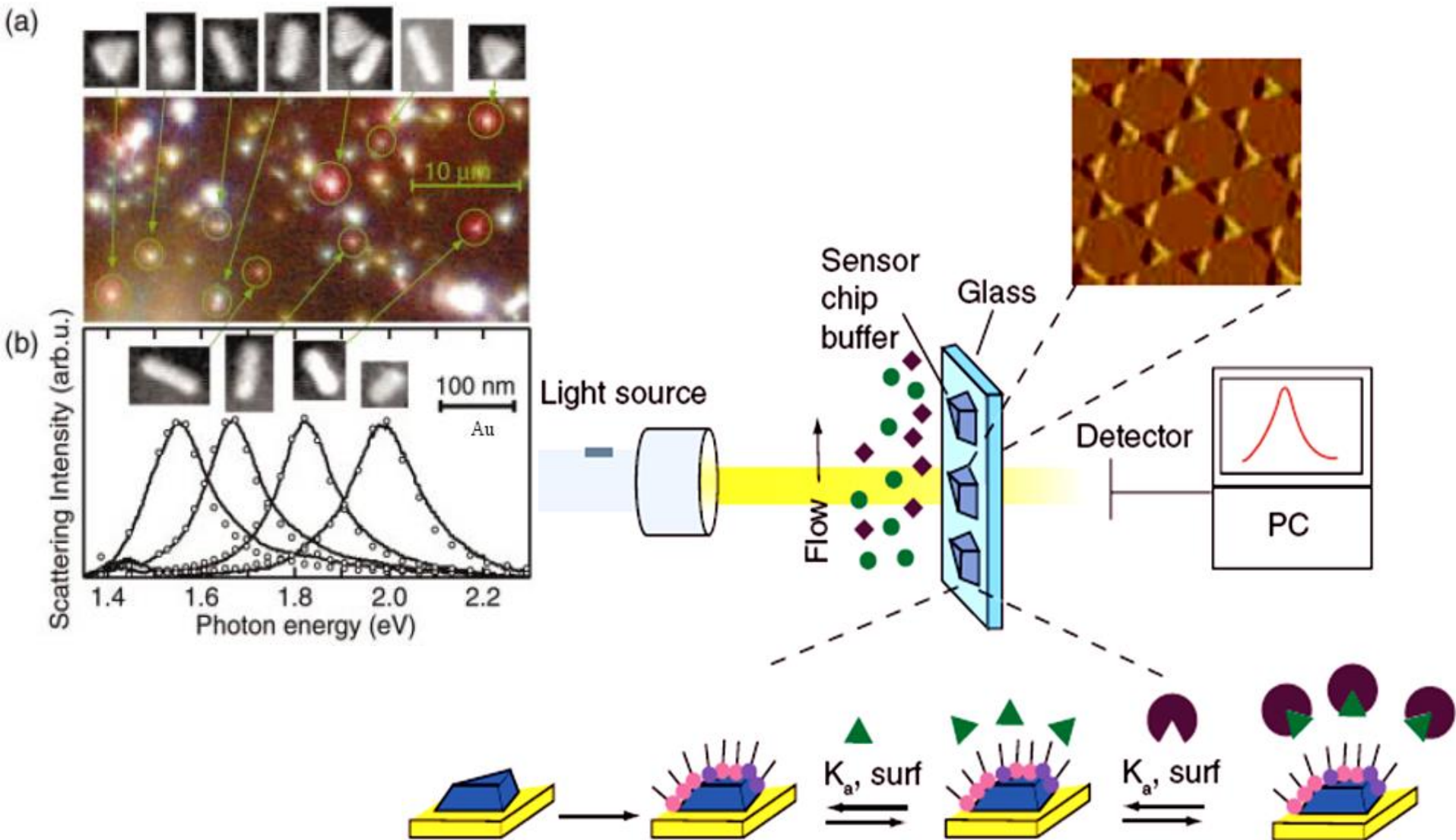
# 10 Plasmonic devices for superfocusing/imaging

## Diffraction-free Negative Superlens

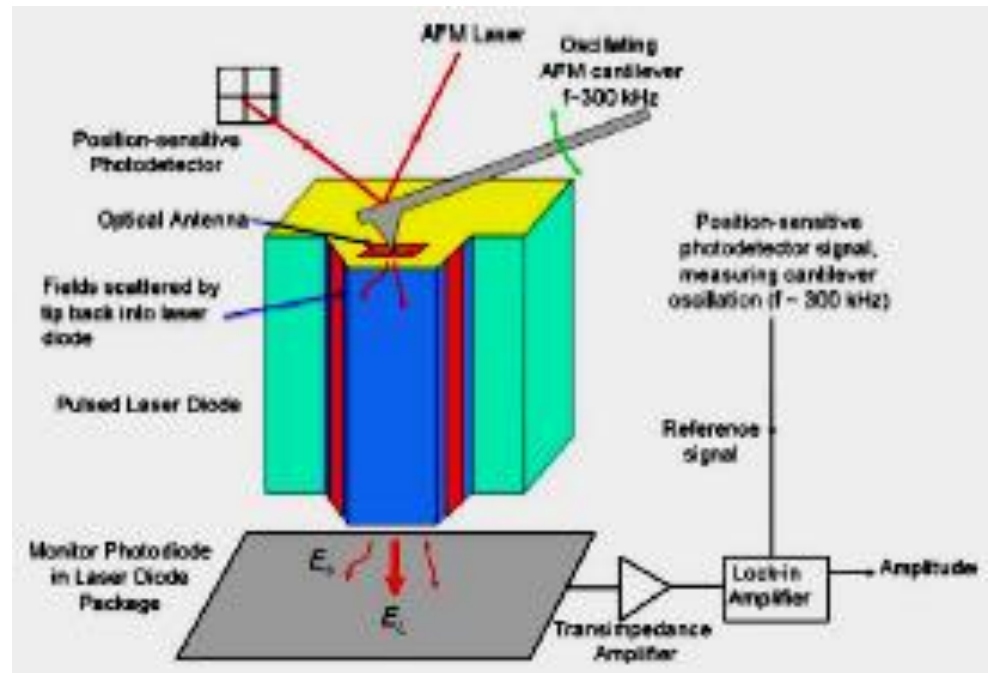
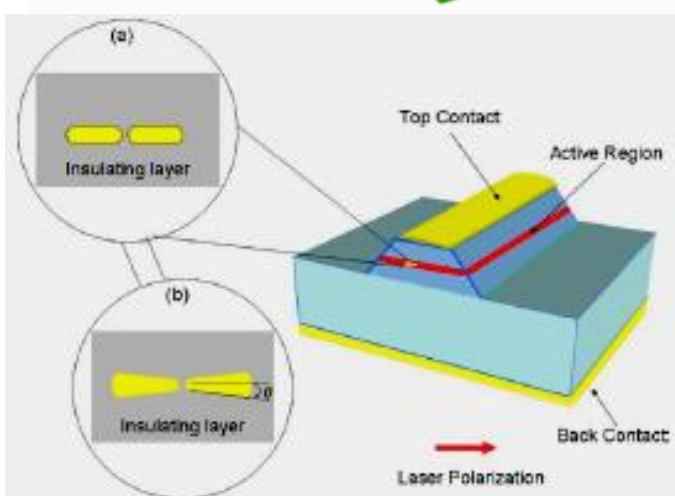
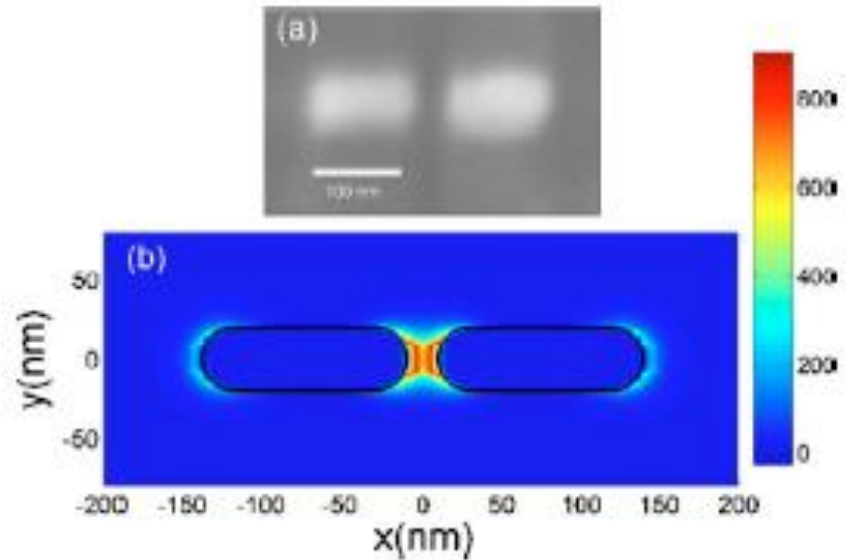
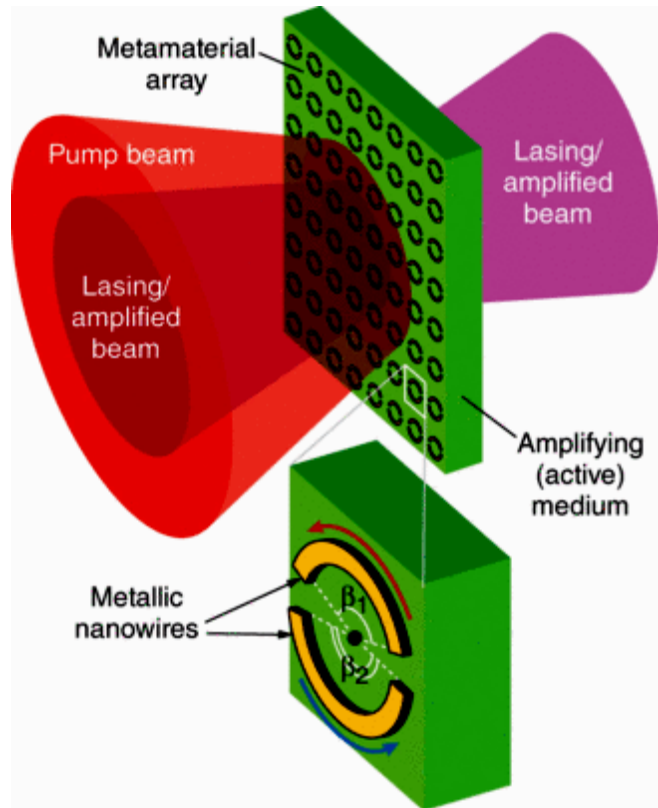




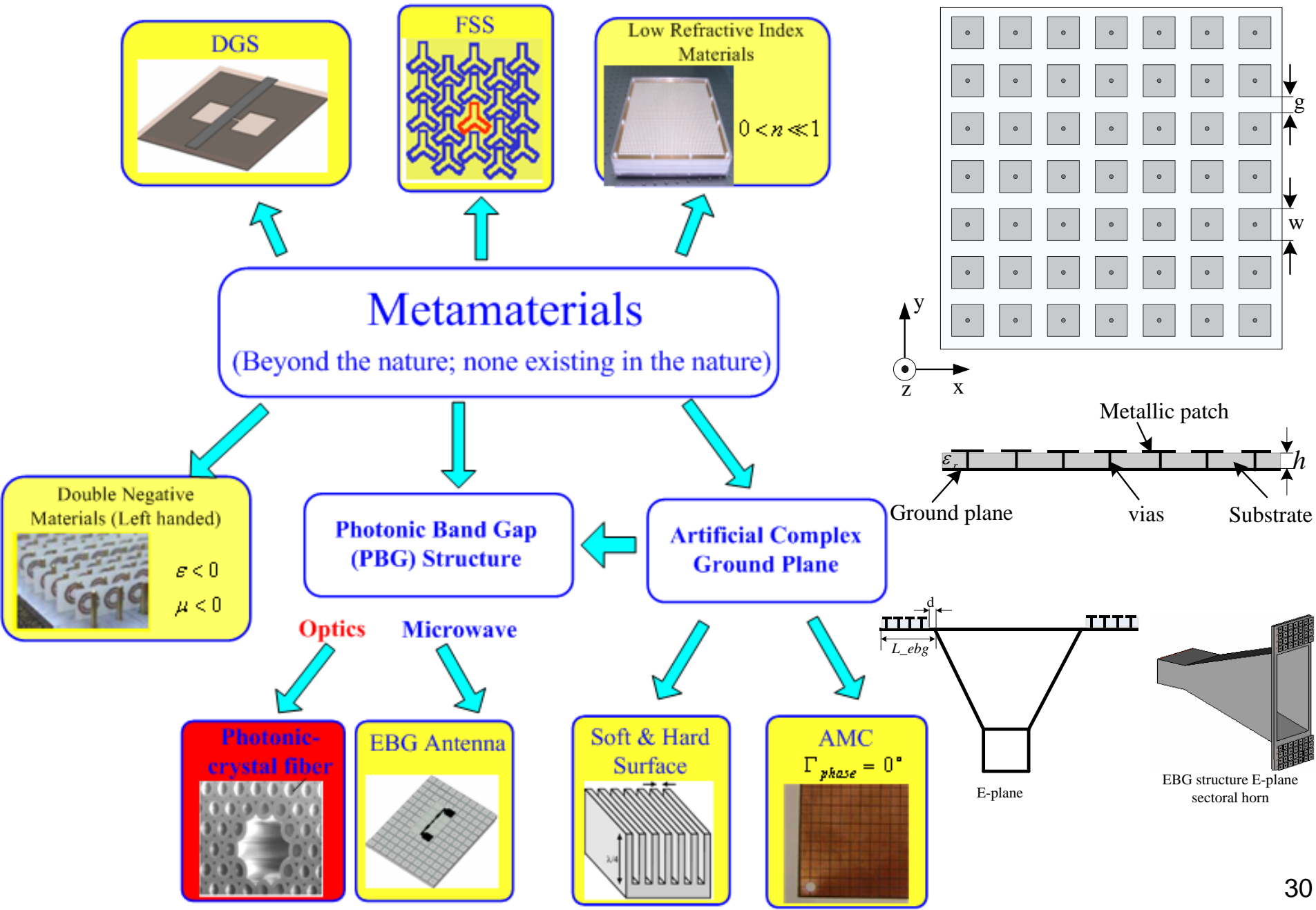
# 11 LSPR-based immunoassay



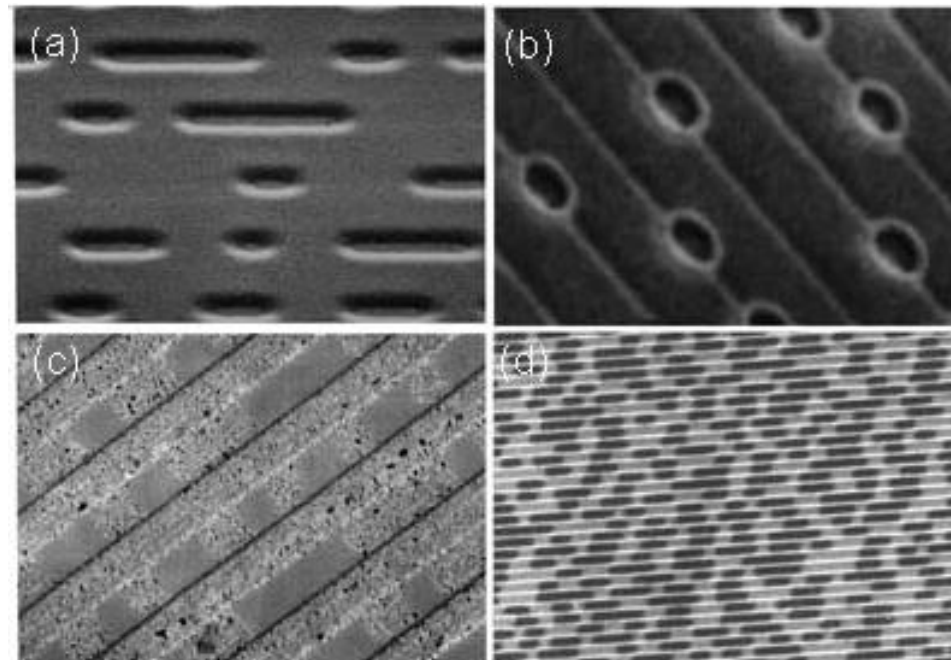
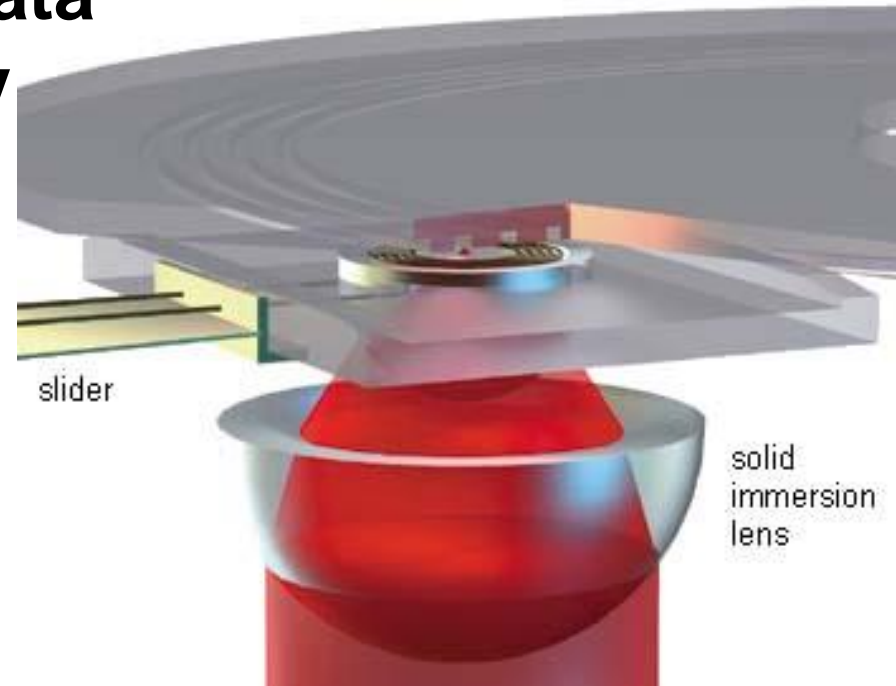
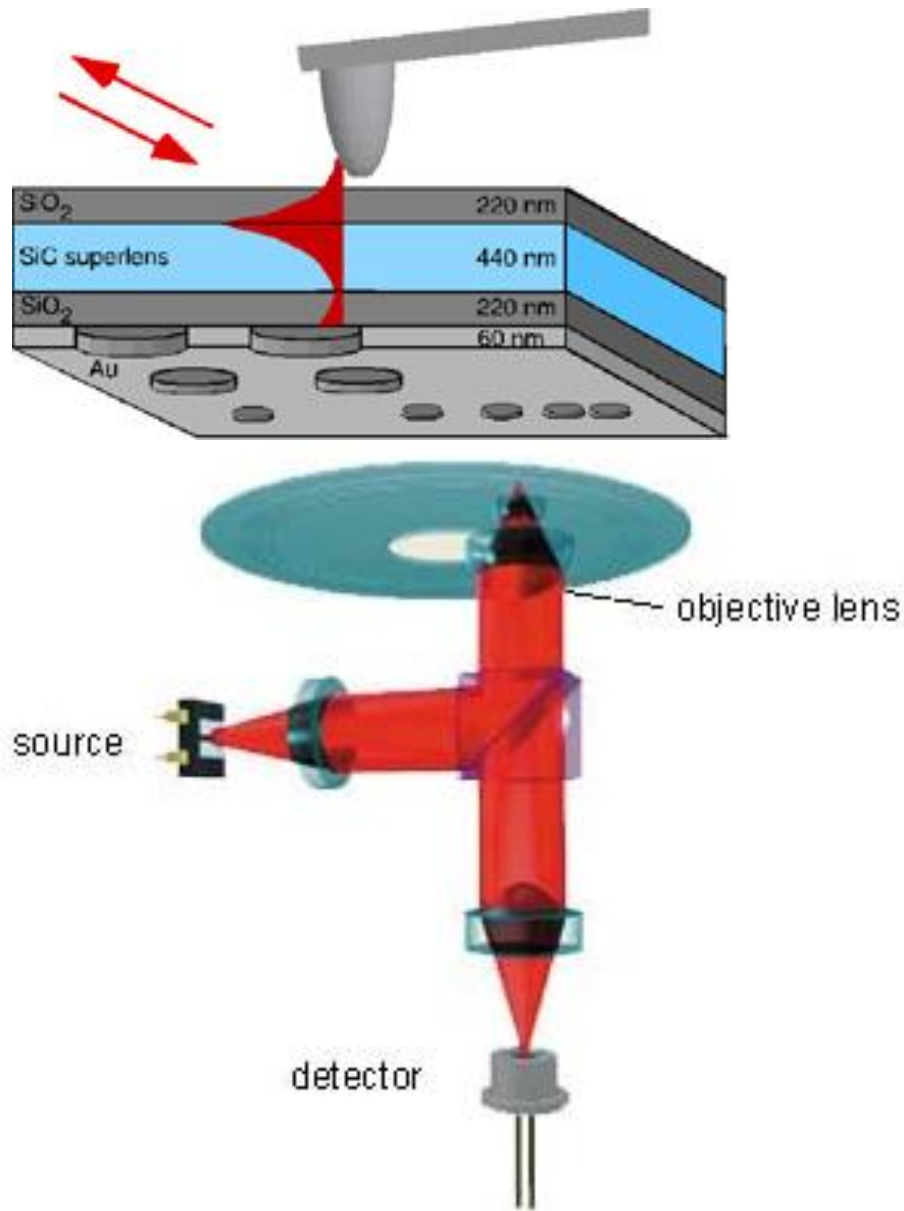
## 12 Plasmonic Lasers



# 13 Metamaterials for Antenna Applications

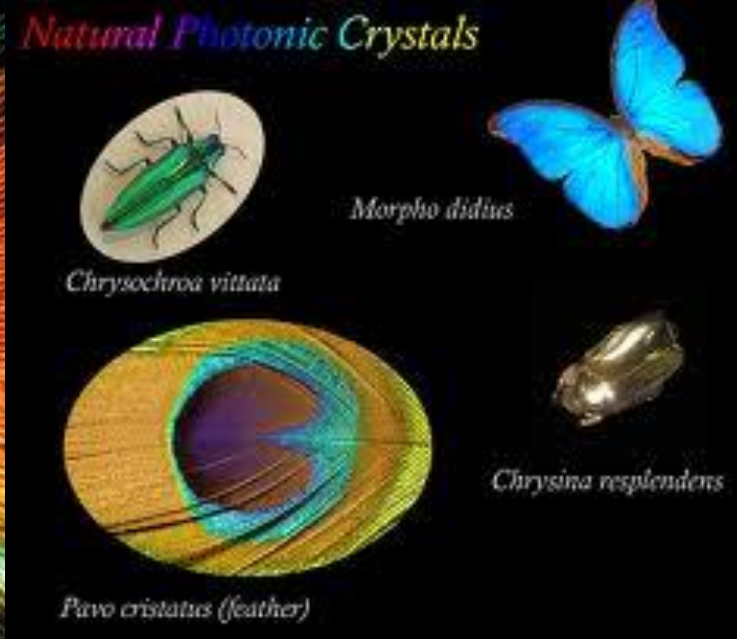
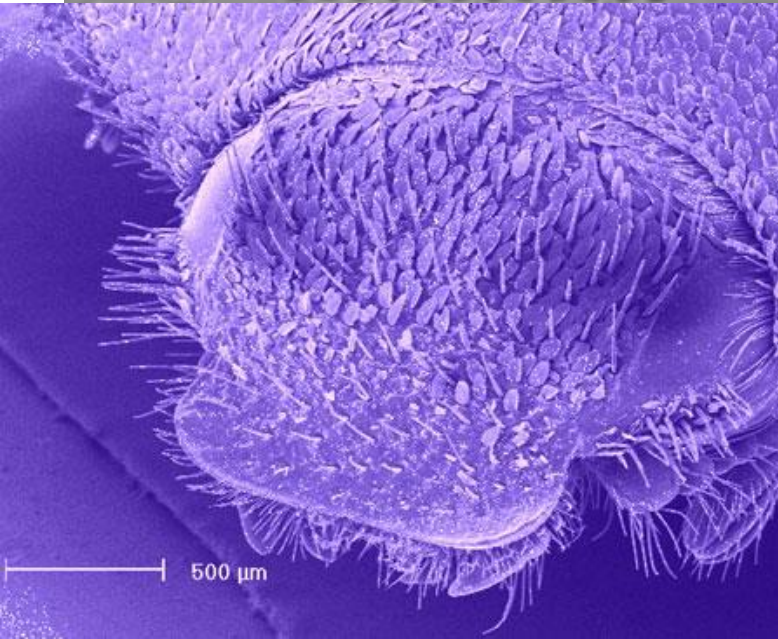
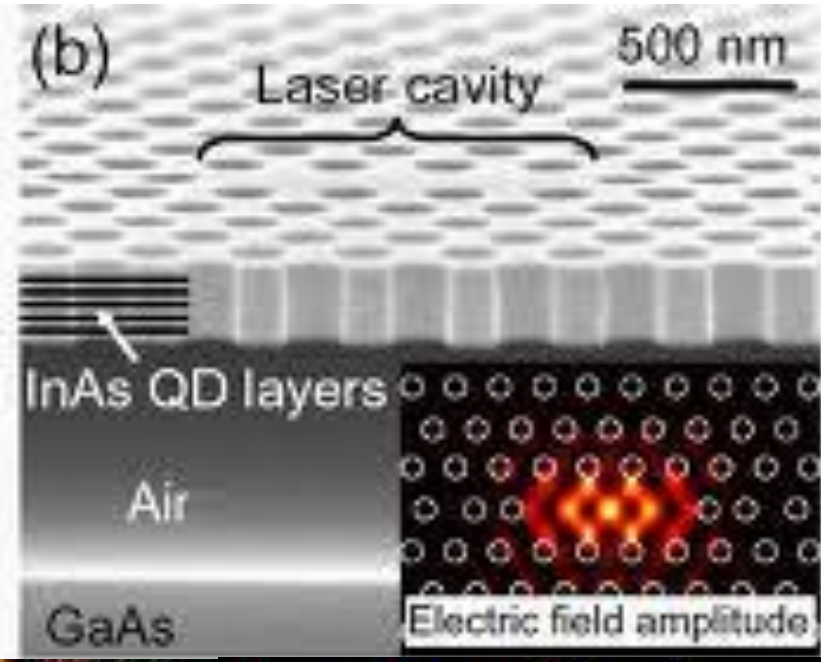
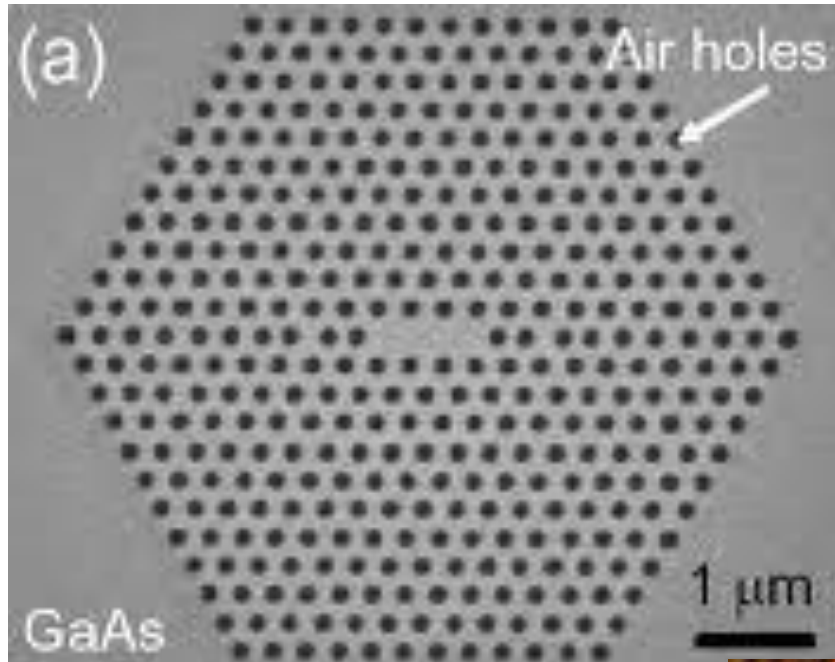


# 14 Plasmonic devices for data storage and nanometrology





# 15 Photonic Crystals





## 16 Future tendency

## 17 Conclusion and discussions



*THE END*

# **SUGGESTION:**

Change the course teaching starting time from 2:30pm to be 1:00pm



**A short sleeping after lunch**

Today

&lt; | &gt;

Feb 2023

Day

Week

Month

GMT-8

Sun

19

校历寒假

Mon

20

Tue

21

Wed

22

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23

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24

Sat

25

12 PM

1 PM

2 PM

3 PM

4 PM

5 PM

6 PM

7 PM

8 PM

Nano-  
optics

1-2:35pm

Nano-  
optics

1-2:35pm

***New teaching time in future incoming classes***