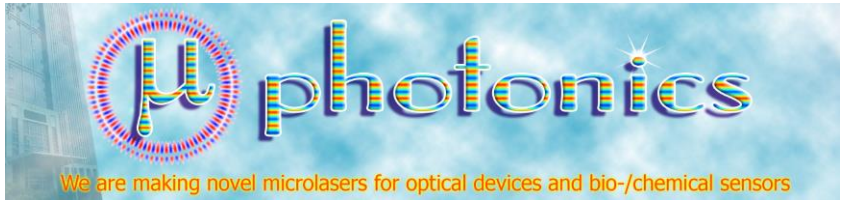
Le Quy Don Technical University
Department of Optical Devices



http://microphotonics.vn

Smart biolasers for healthcare

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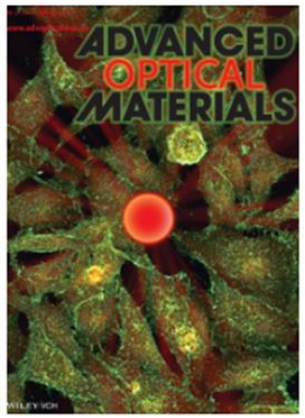
Conference for young researchers
25/4/2024

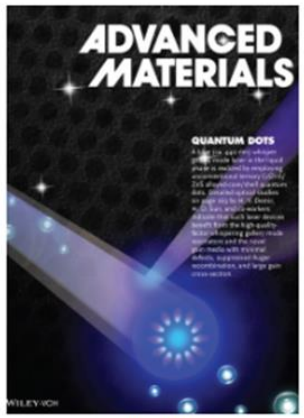
Outline

1. Introduction
2. Laser and random lasers
3. Recent advances in biolasers for healthcare
4. Our contribution to biolasers

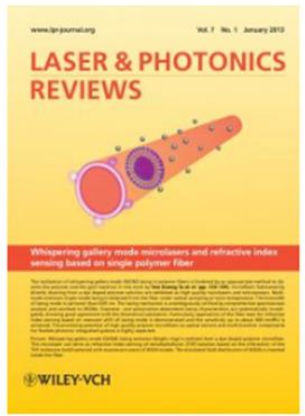
HOMEPAGE / RESEARCH / MEMBERS / PUBLICATIONS / GALLERY / NEWS / EVENTS / JOIN US



Biolasers



Quantum dot laser



Flexible lasers

News and Announcement

- Paper accepted for publication in Soft Matter
  Congratulations to Tam Nguyen for his work entitled "Chicken albumen based whispering gallery mode microlasers" has been accepted for publication in Soft Matter.
- Paper published in Nanoscale
  Duong's paper entitled "Flexible and tensile microporous polymer fibers for wavelength-tunable random lasing" has been published in Nanoscale.
- Paper published in Optics Communications.
  Duong's paper entitled "Silica based biocompatible random lasers implantable in the skin" has been published in Optics Communications.
- Paper published in Journal of Physics D: Applied Physics
  Toan's paper entitled "Egg white based biological microlasers" has been published in Journal of Physics D: Applied Physics.
- Congratulation to Dr. Duong Ta
  Dr. Duong Ta's review paper entitled "Microlasers Enabled by Soft-Matter Technology" has been published on Advanced Optical Materials.

Our sponsors

LE QUY DON Technical University

NAFOSTED National Foundation for Science & Technology Development

http://microphotonics.vn/

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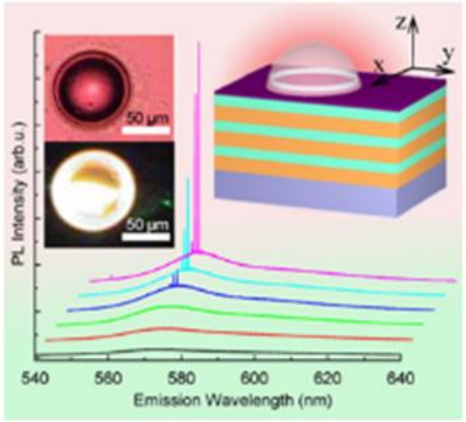
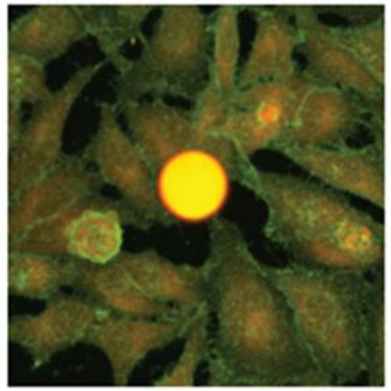
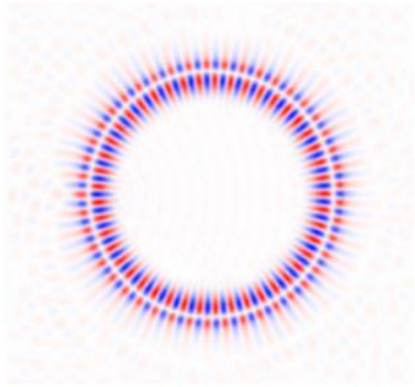
Research interests



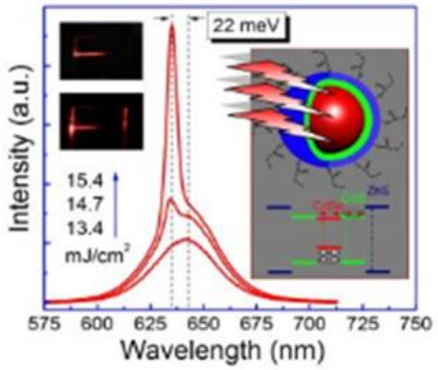
Flexible Microlasers



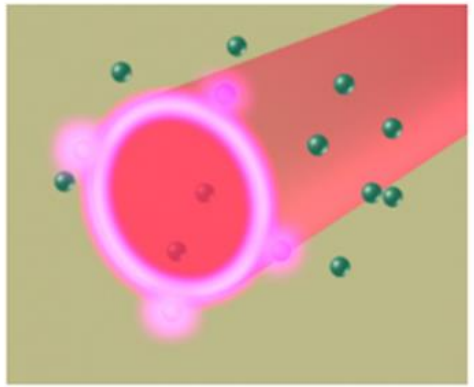
Biolasers



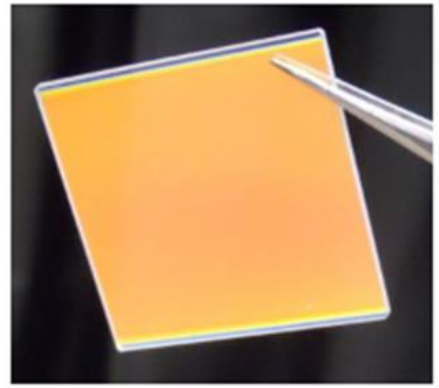
Optical Simulations



Random lasing

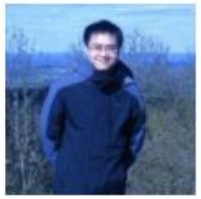


Biosensing



Optical thin films

Group members



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Professional services

Associate Editor

ADVANCES IN NATURAL SCIENCES: NANOSCIENCE AND NANOTECHNOLOGY

Reviewers

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- Advanced Optical Materials
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- Analytical Chemistry
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- ……

Happiest moments at Vietnam School of Science

1 Introduction

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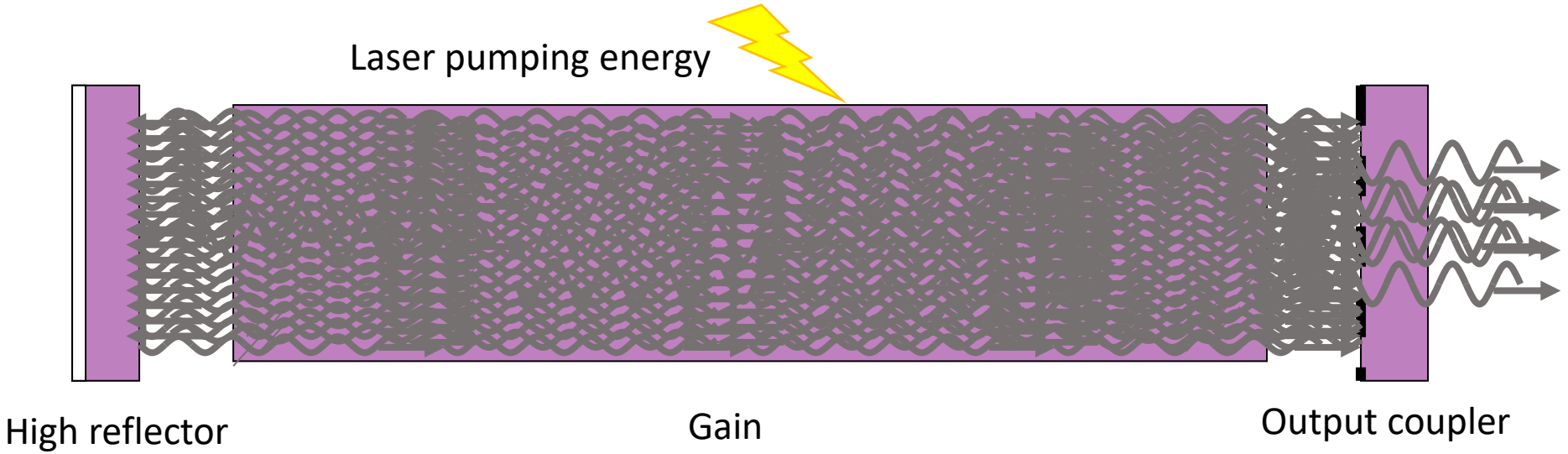
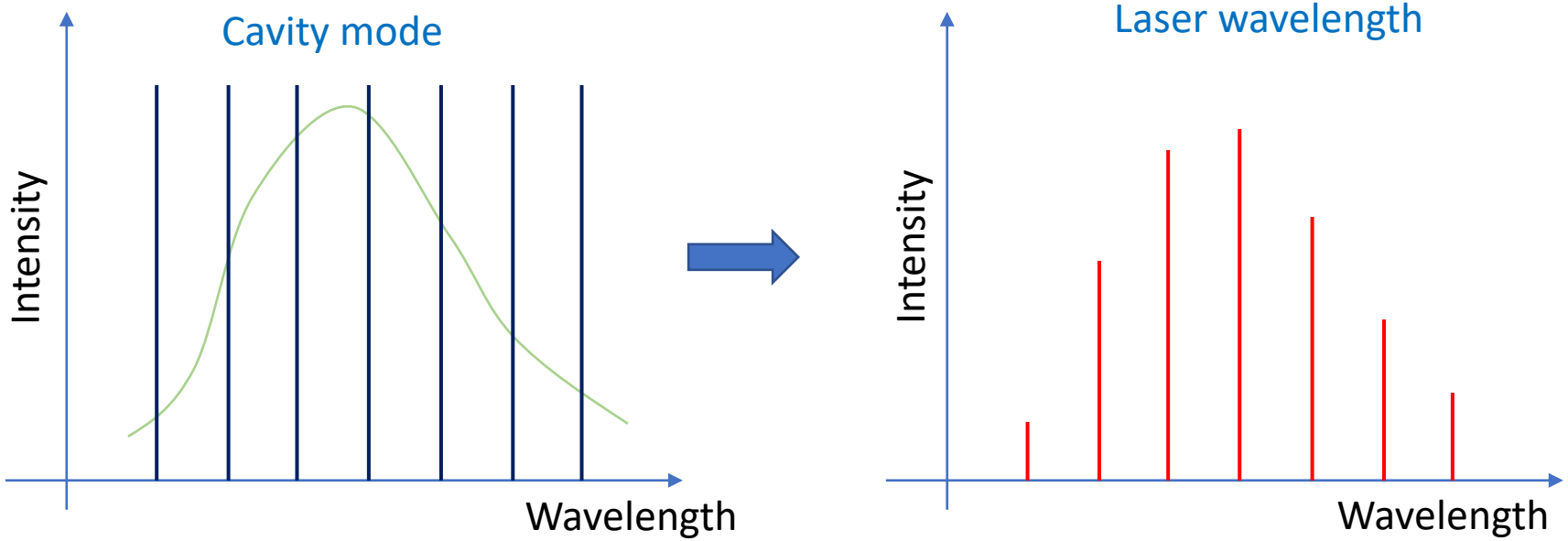
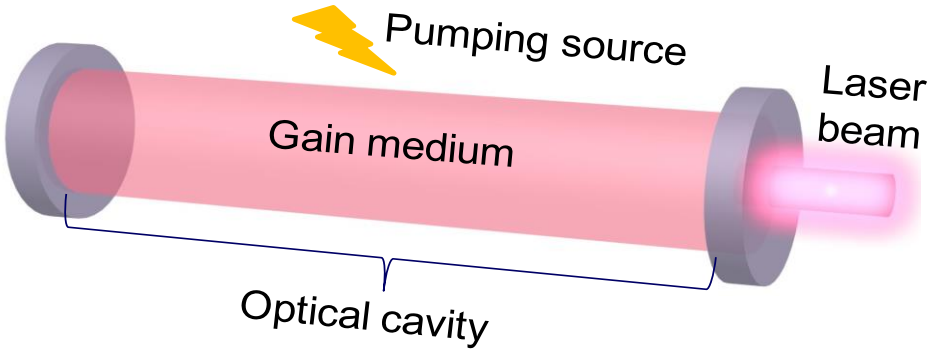
How does a laser work?

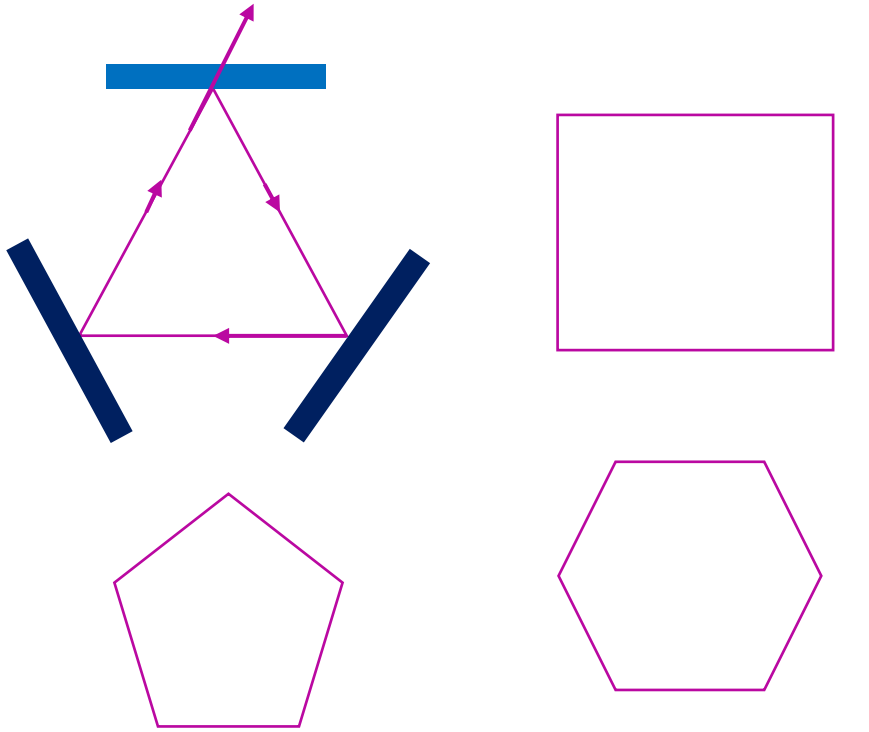
LASER (light amplification by stimulated emission of radiation)



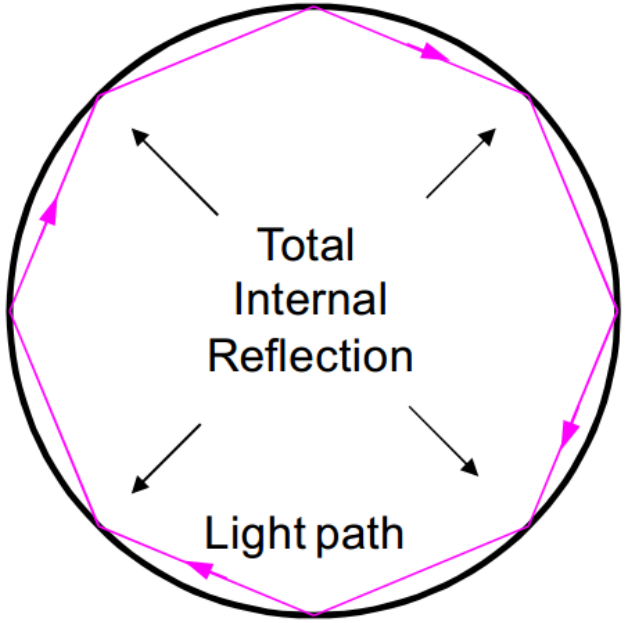


Microsphere lasers





Mirrorless lasers

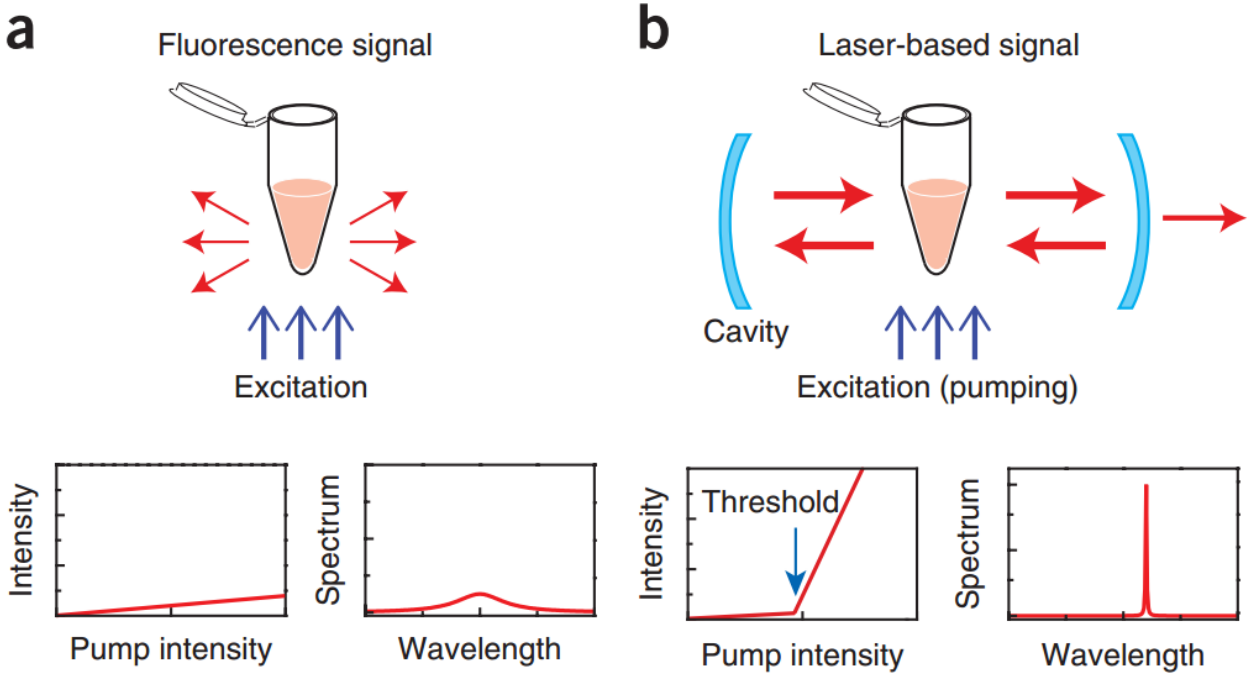


V. D. Ta, *et al.*, *Appl. Phys. Lett.* **107,** 221103 (2015)

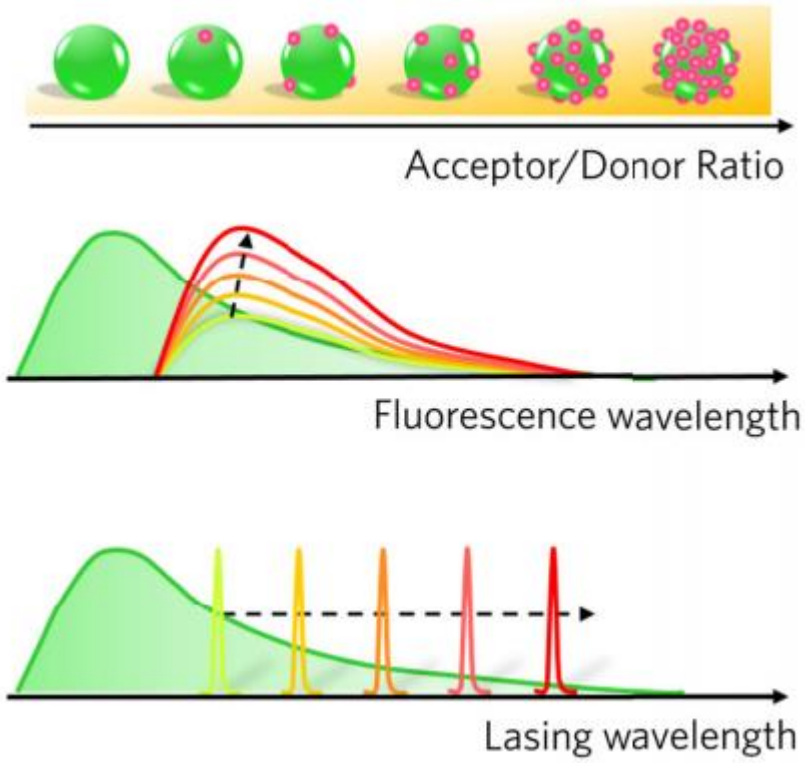
Why biolasers are great?

1. Environment-friendly
2. Biocompatibility----Implantable optical devices.
3. Sensitive way to measure changes in biological molecules/internal cells, tissues

Laser enhances sensitivity



X. Fan, S.-H. Yun, *Nat. Methods* **11,** 141 (2014).



Yuan, Z. *et al.* in CLEO conference, ATh3K.1

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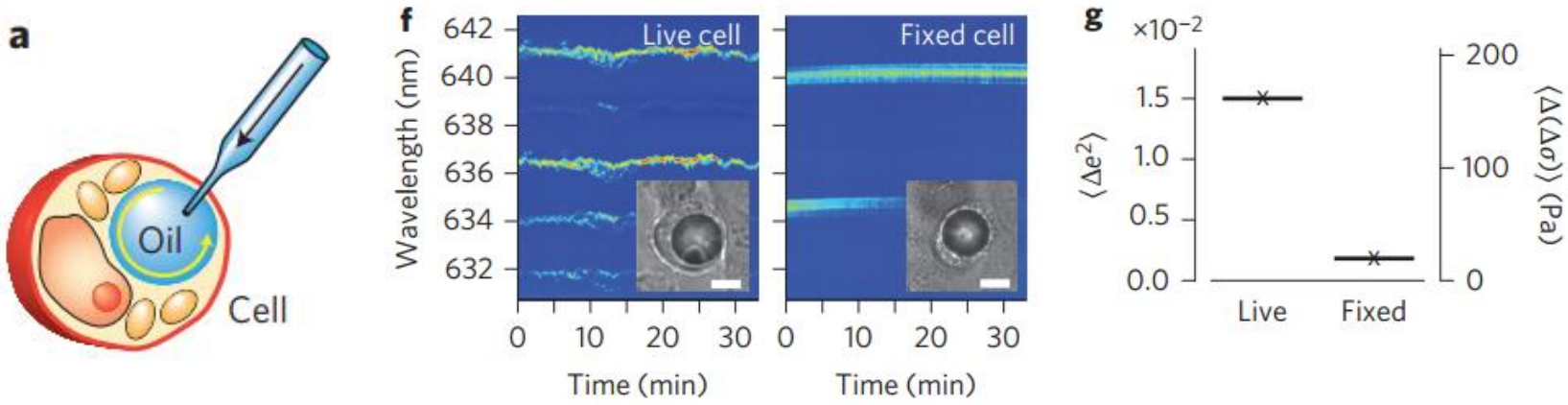
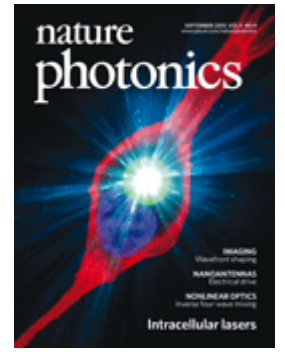
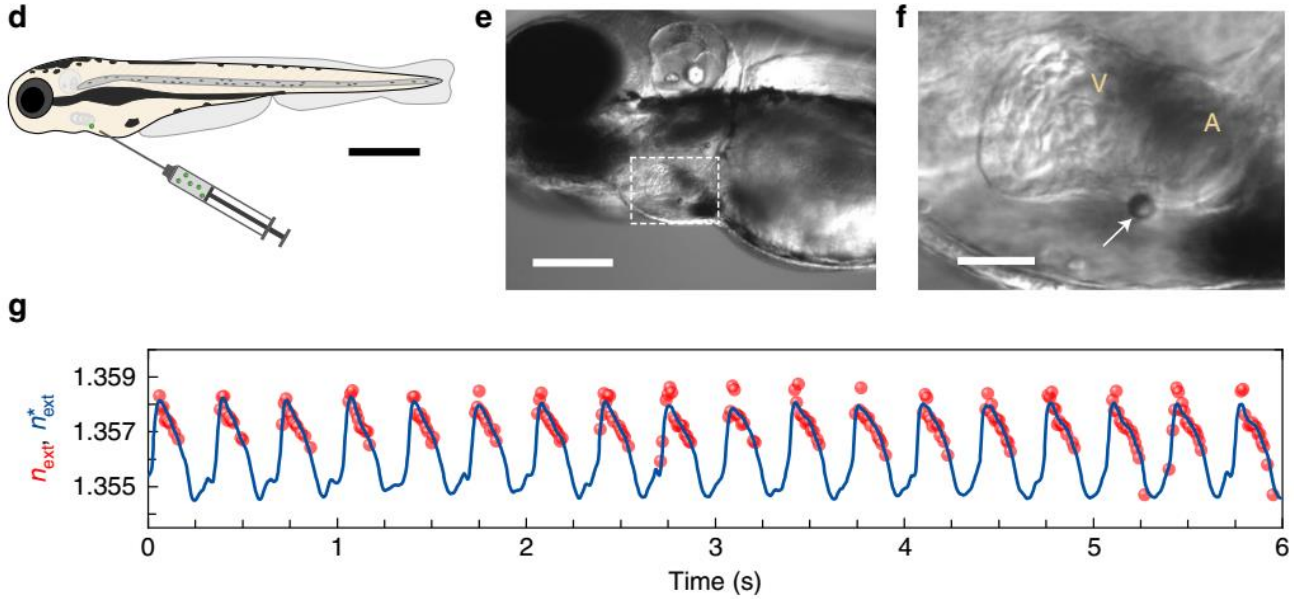
4 Our contribution to biolasers

Biolasers for intracellular sensors



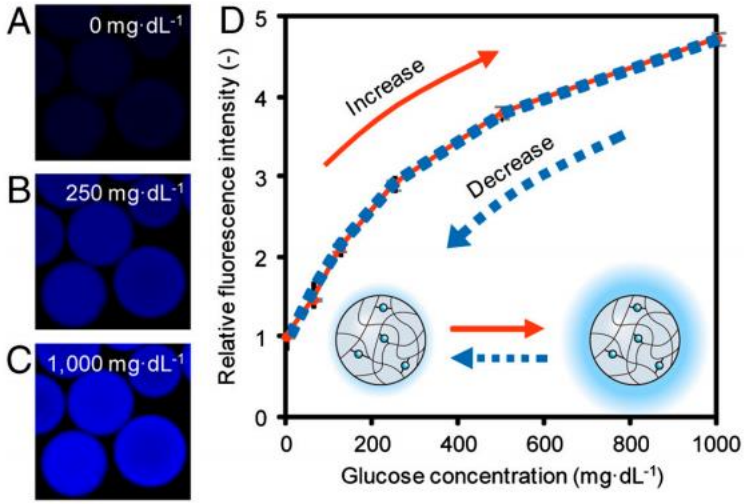


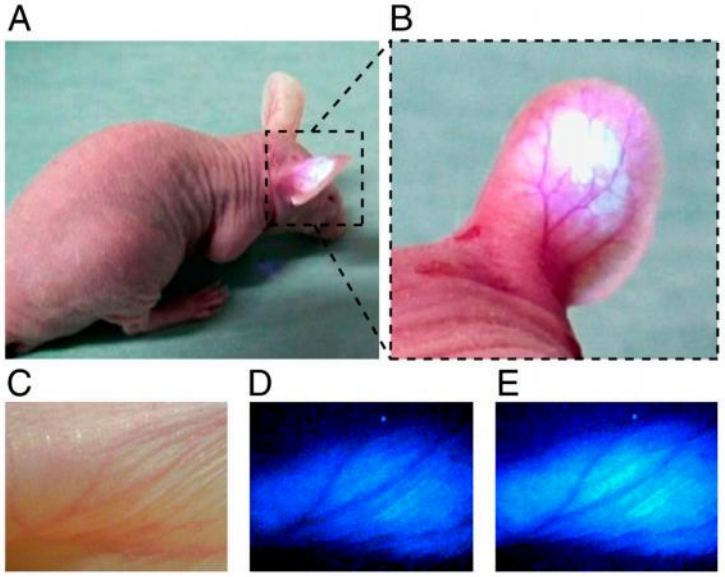
Humar, M. & Hyun Yun, S.
Nat. Photon. **9**, 572-576 (2015)

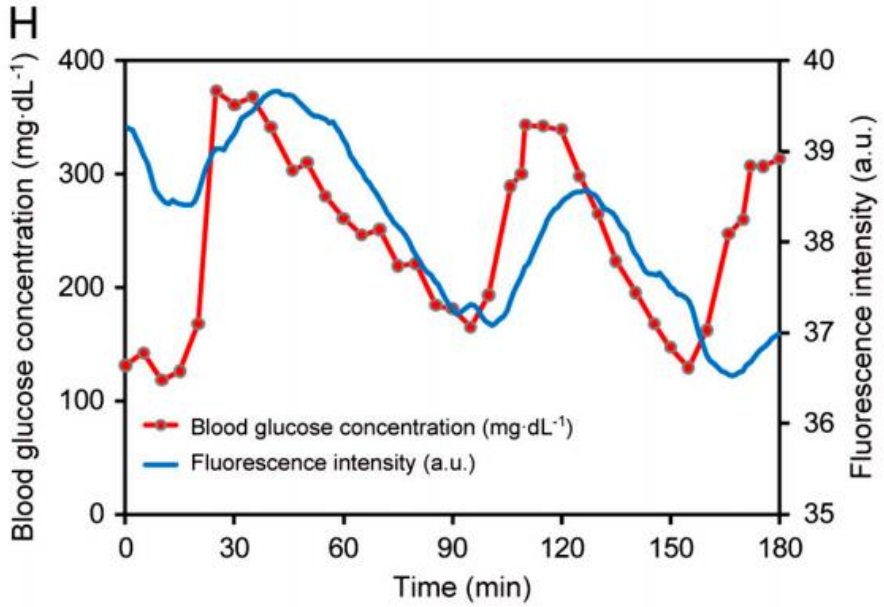


Schubert, M. *et al.*
Nat. Photon. **14**, 452-458 (2020)

Glucose sensing



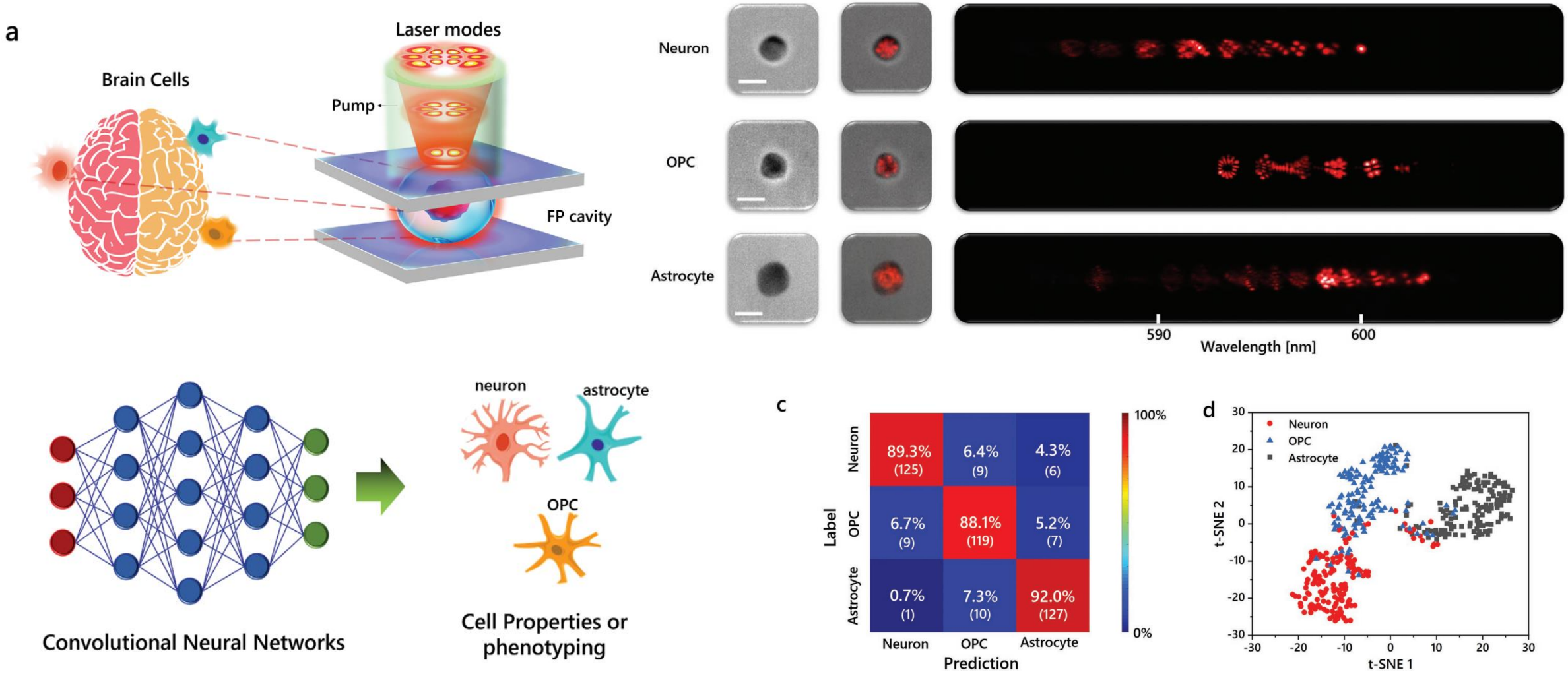




Northeastern University

Proc. Natl. Acad. Sci. U.S.A. **2010,** *107*, 17894.

Biolasers with AI



Qiao, Z. et al. Adv. Optical Mater. (2021)

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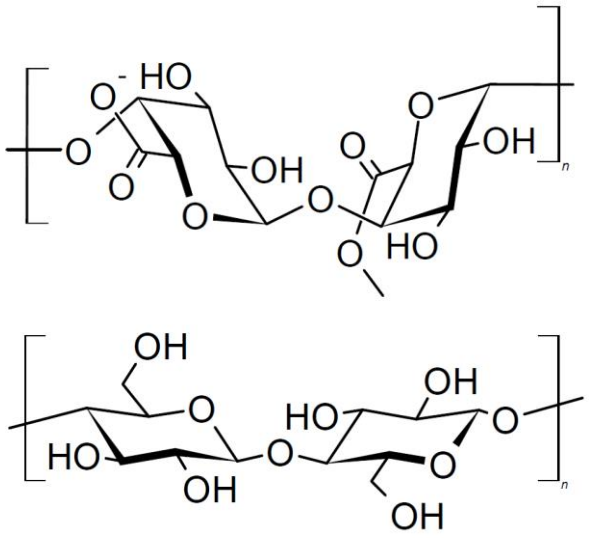
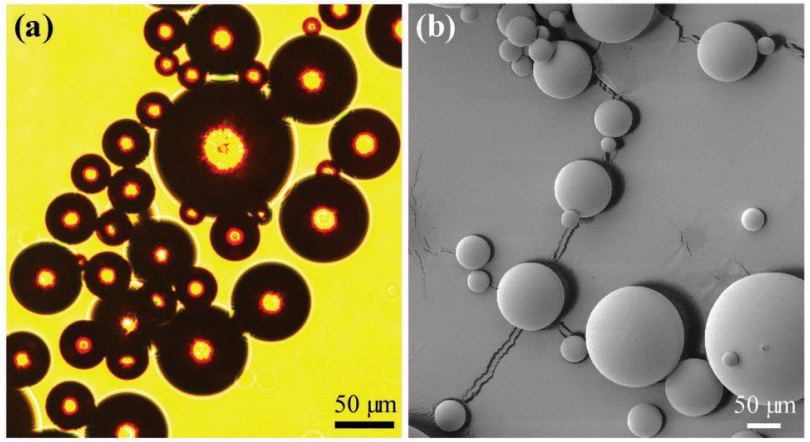
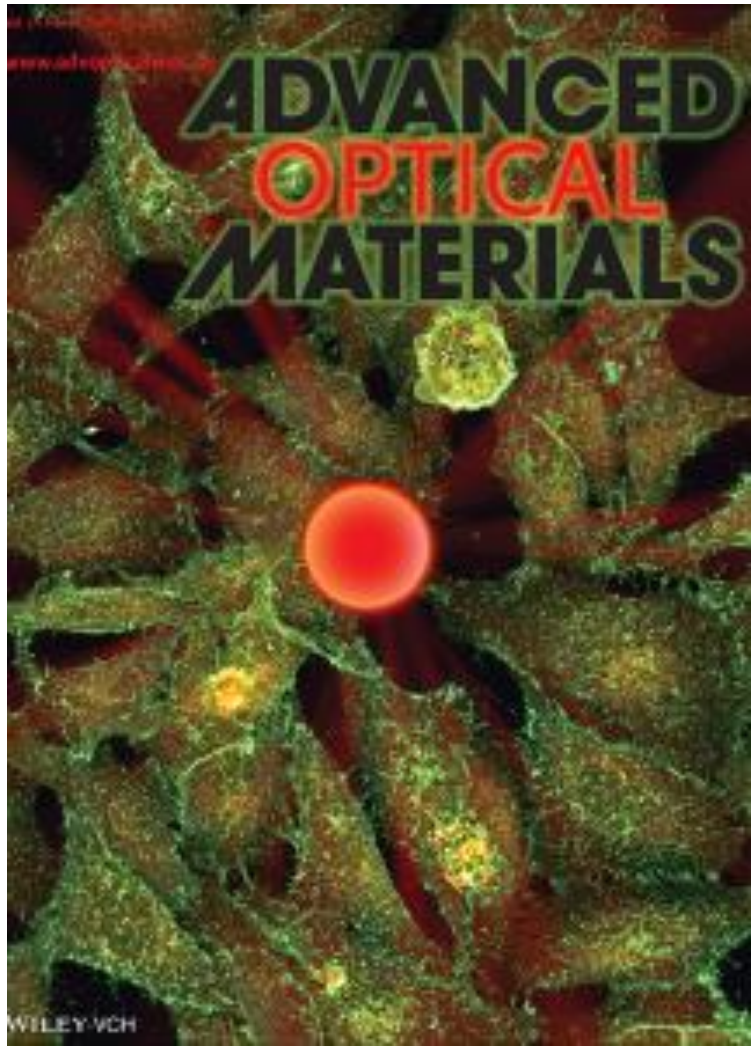
Biolasers from biomaterials

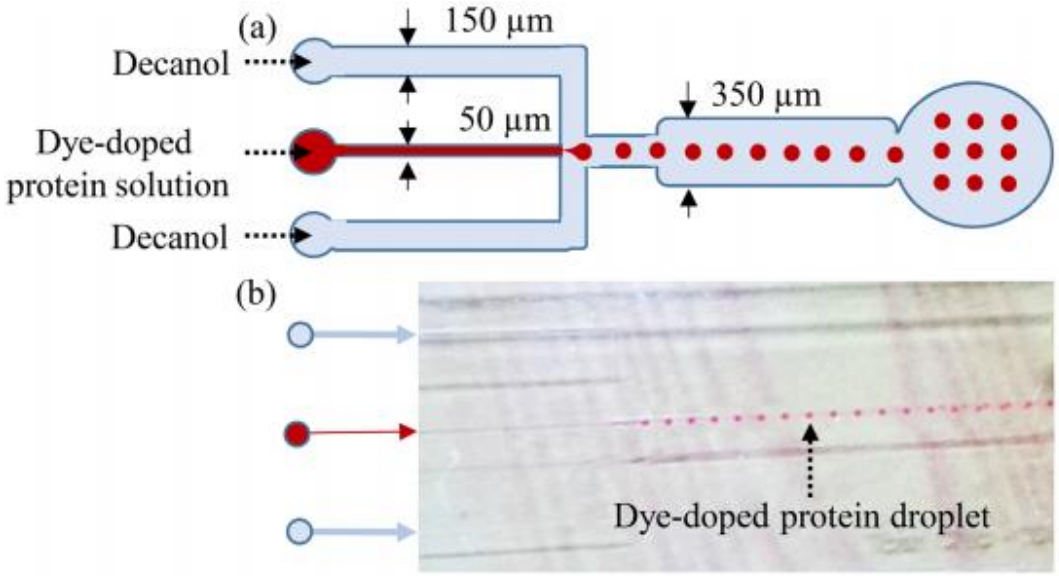


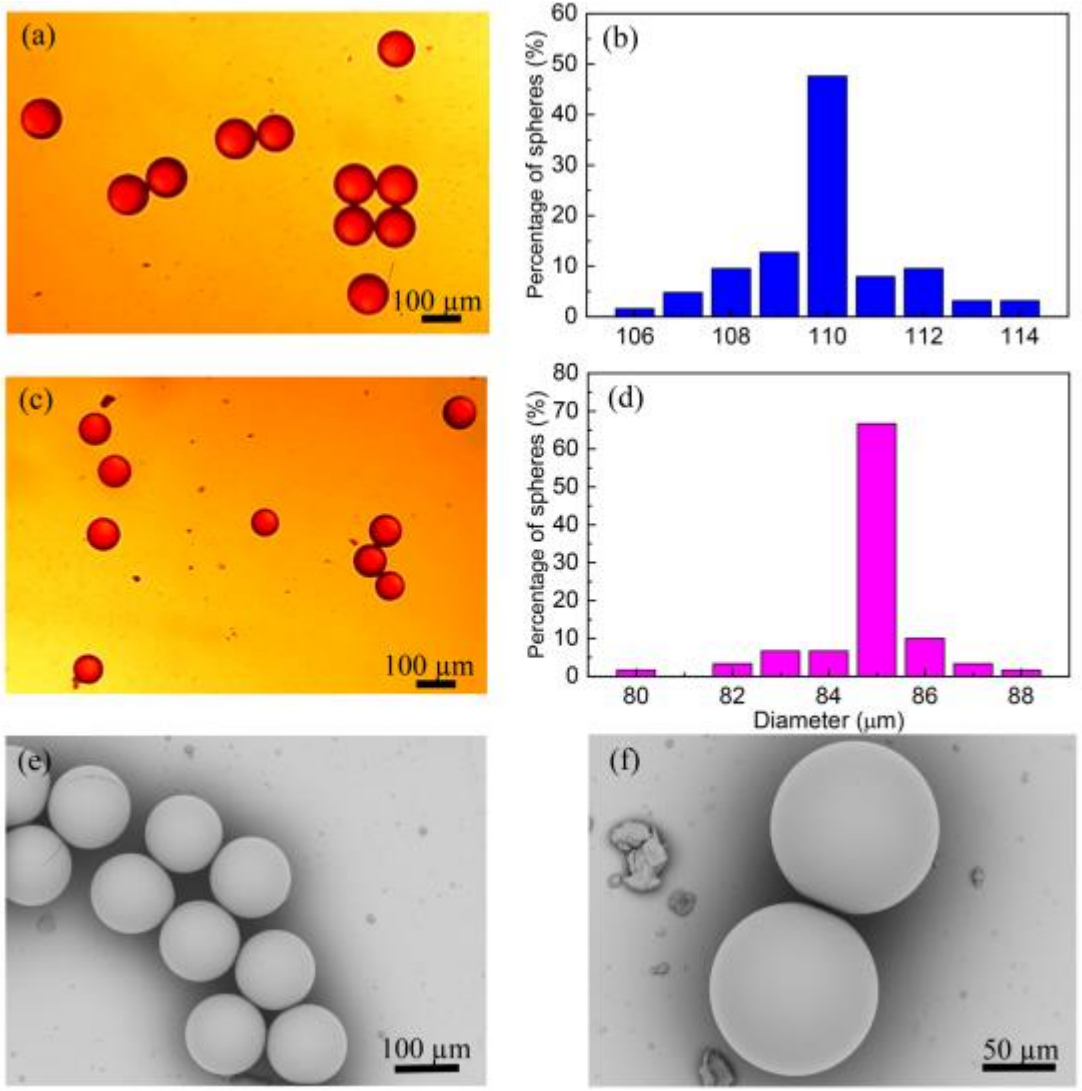




Ta, V. D. *et al. Adv. Optical Mater.* **5**, 1601022 (2017)

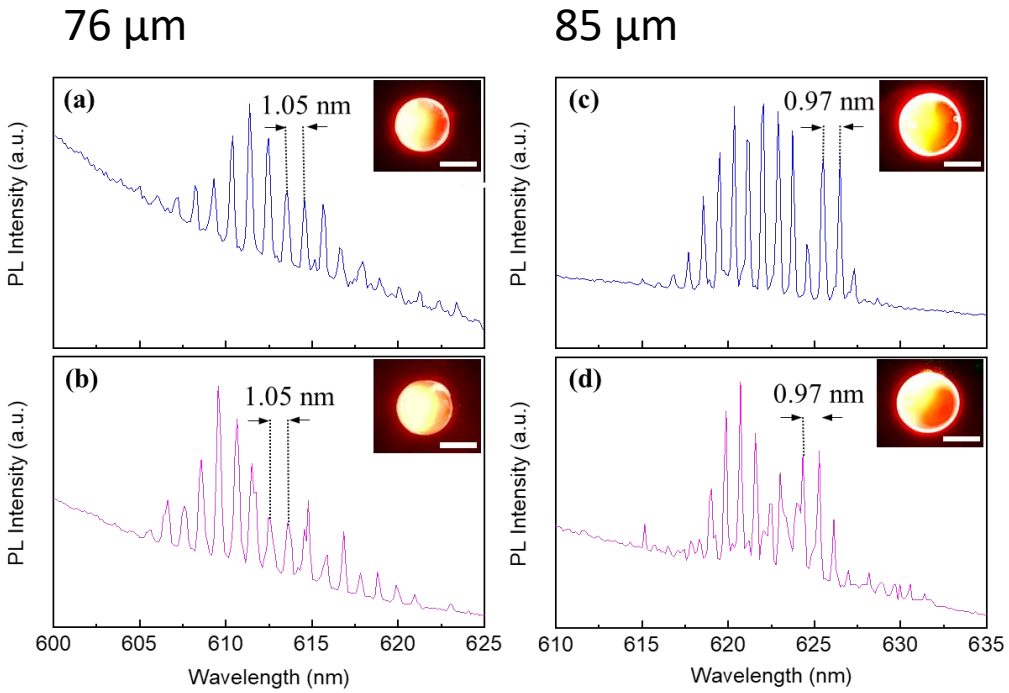
Uniform and tunable size





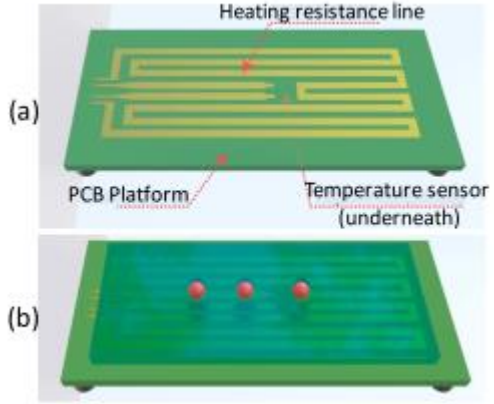
Nguyen, T. V. *et al. Opt. Lett.* **46**, 2517-2520 (2021)

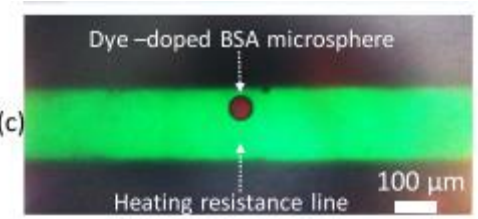
Biolasers as sensitive sensors

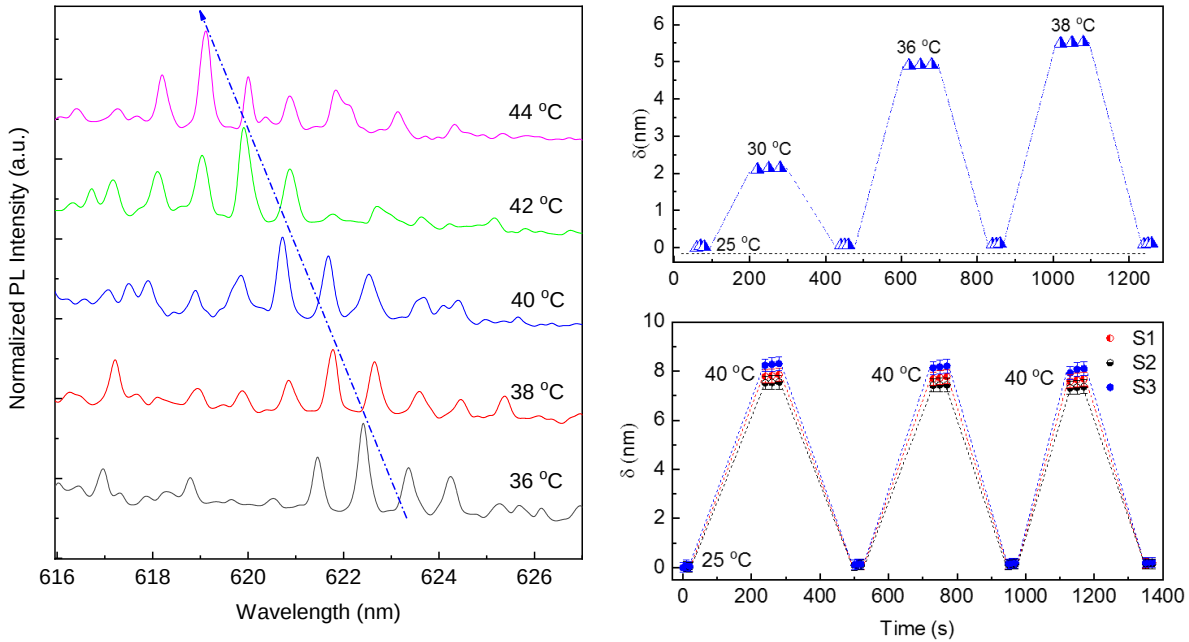


All scale bars are 50 µm

Nguyen, T. V. *et al. Opt. Lett.* 46, 2517-2520 (2021)

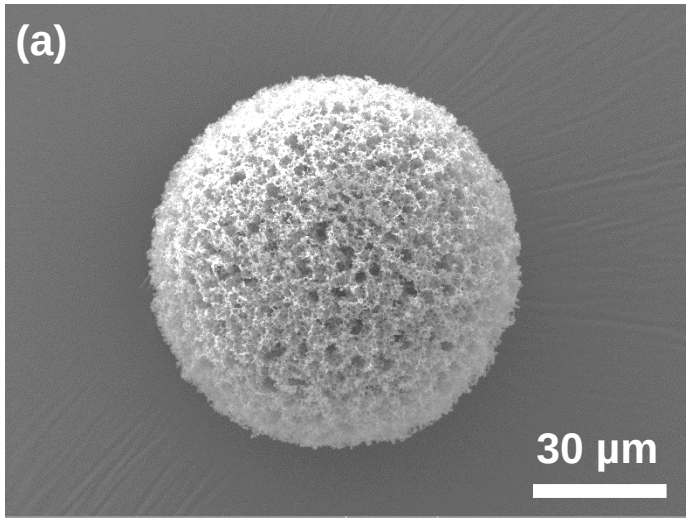


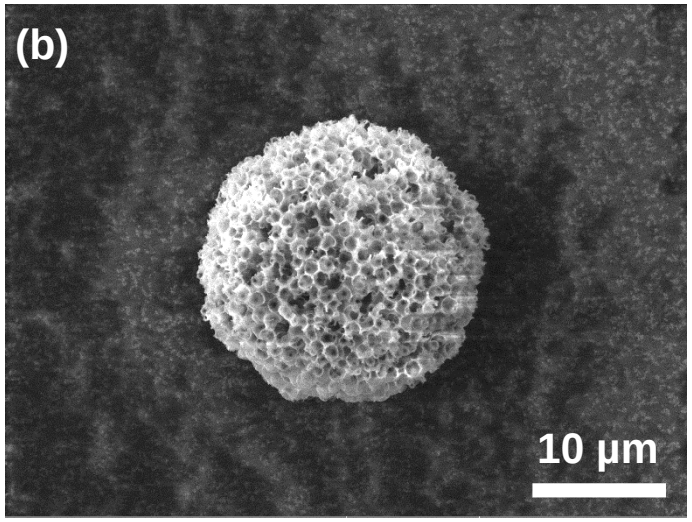


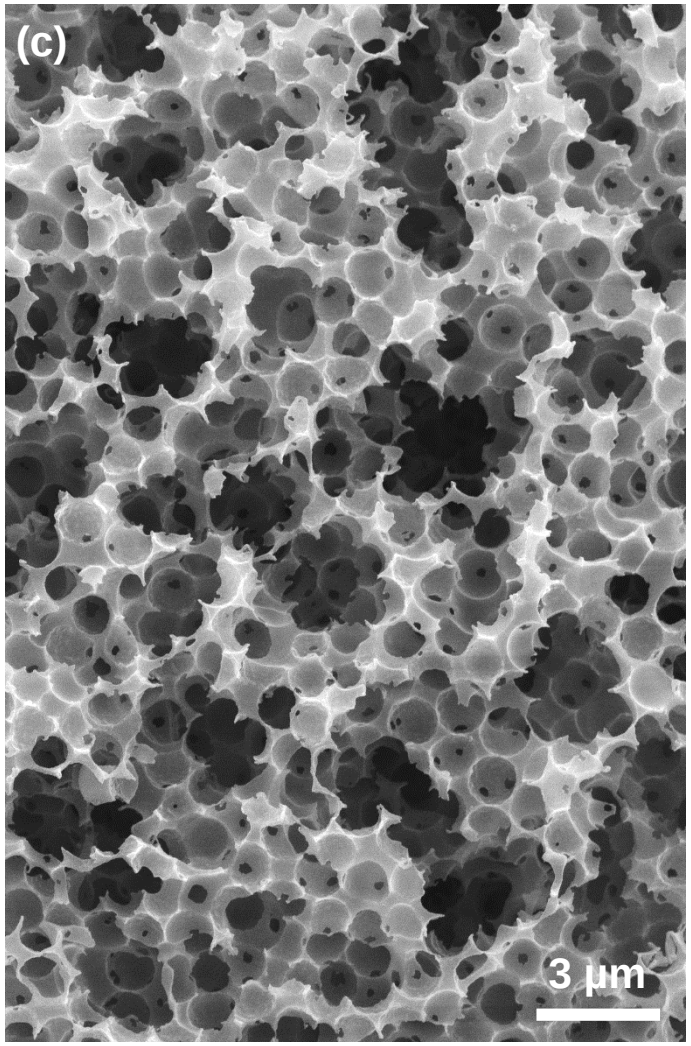


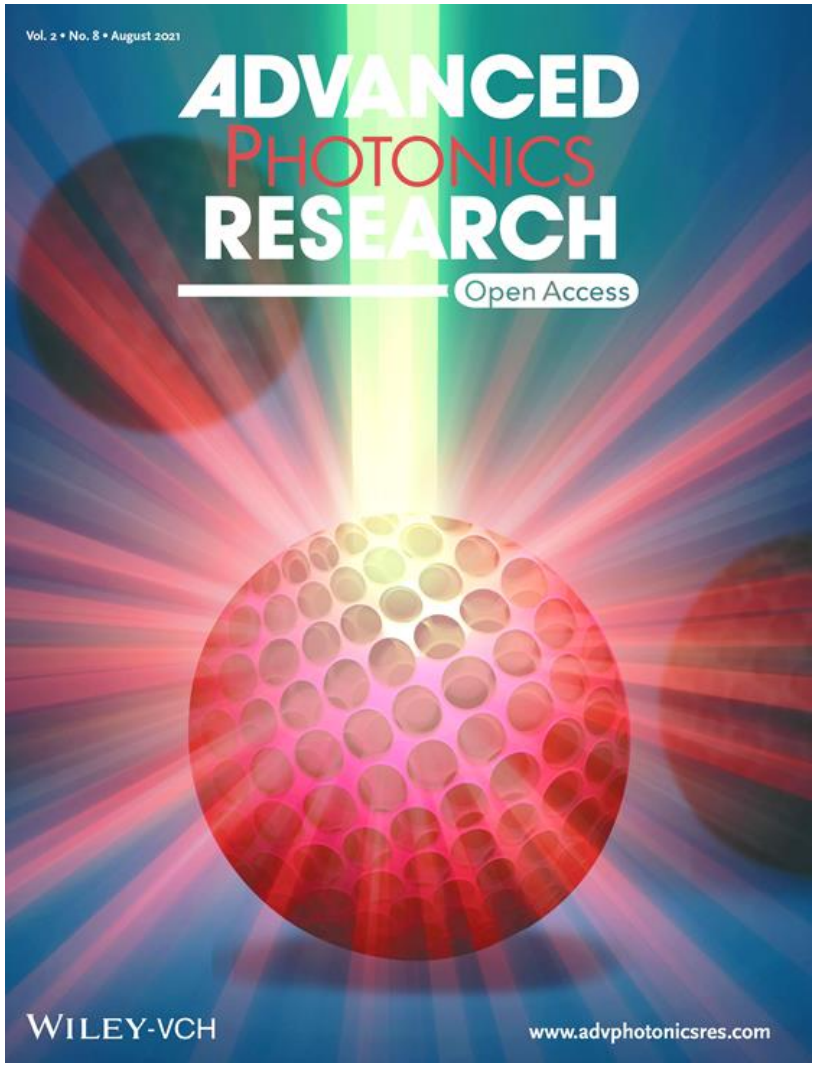
Nguyen, T. V. et al.. J. Phys. D: Appl. Phys. 55, 405402 (2022)

Random microlasers



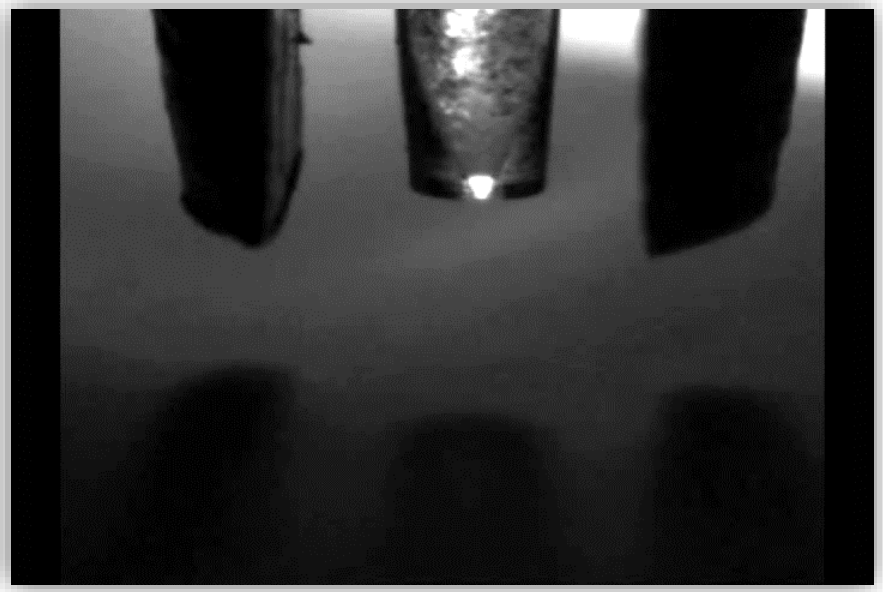


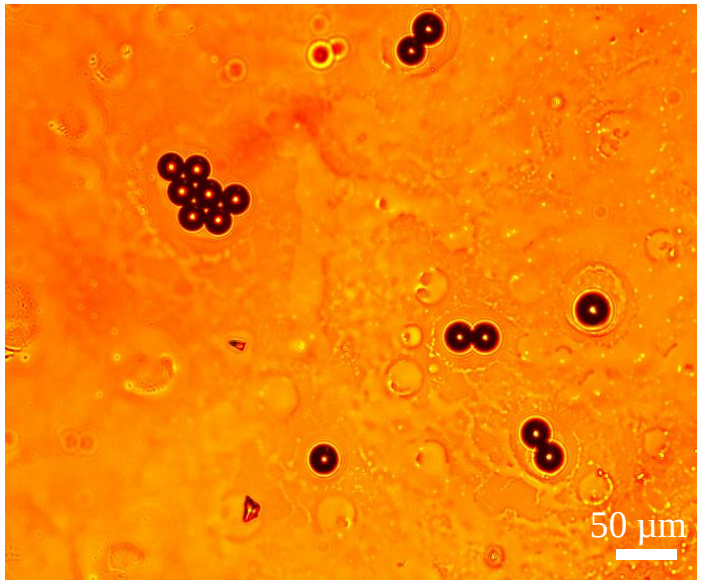


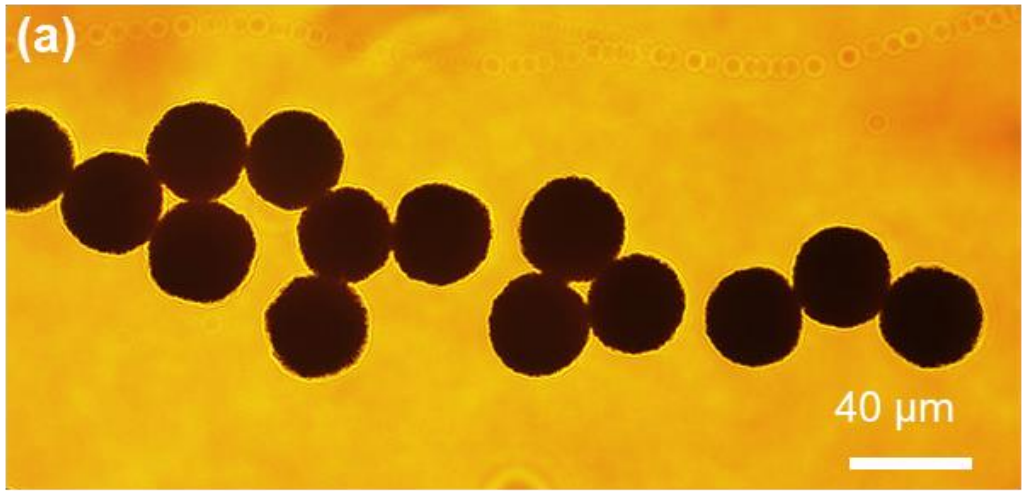


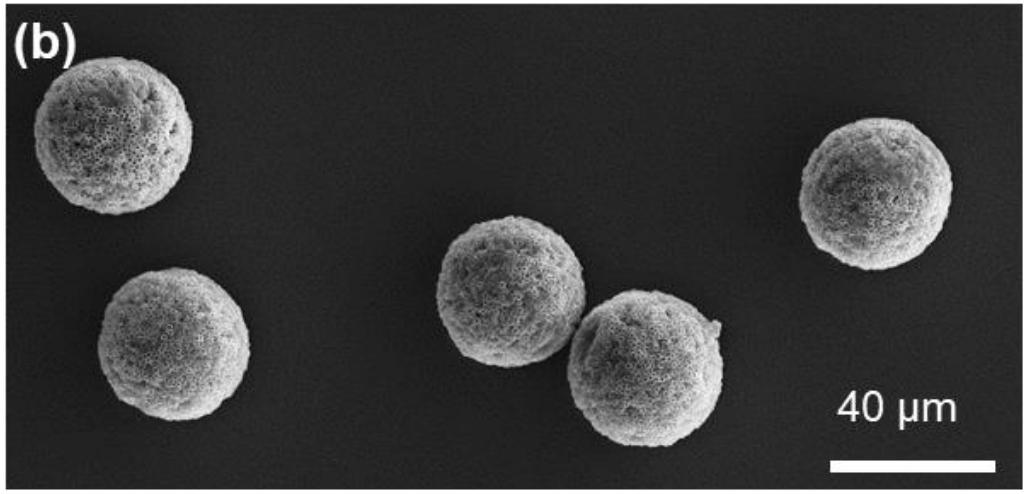
Ta, V. D. *et al. Advanced Photonics Research* **2**, 2170025 (2021).

Uniform and tunable microlasers



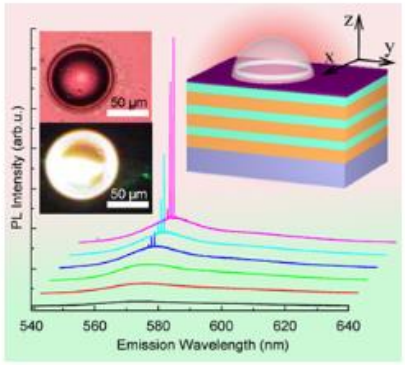




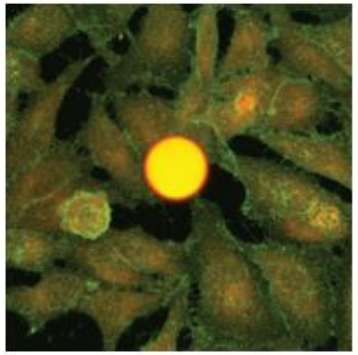


Ta, V. D. *et al.* (Unpublished work)

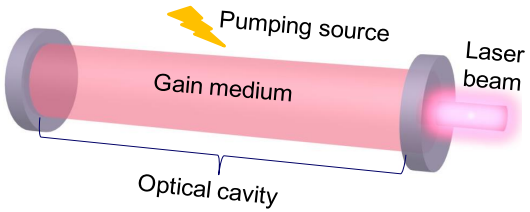
Summary



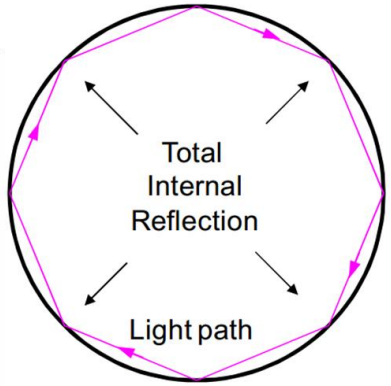
Flexible Microlasers

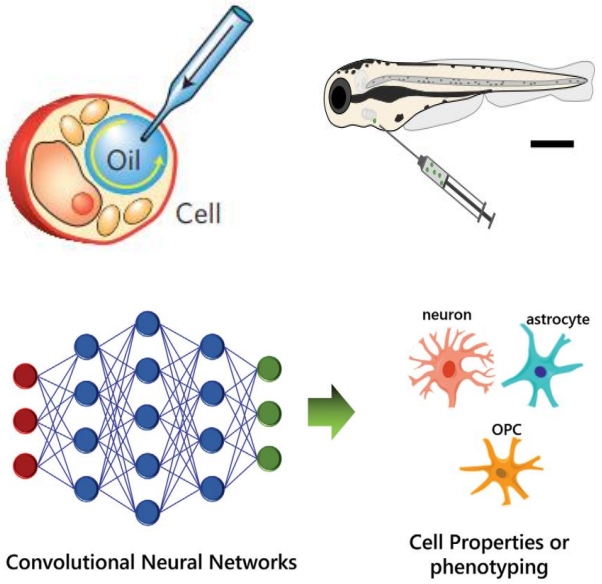


Biolasers

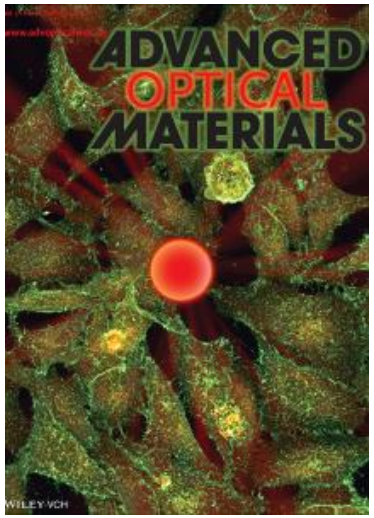


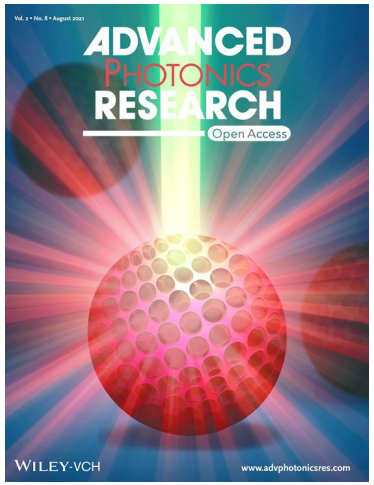
Mirrorless lasers





Northeastern University





Acknowledgement

Professor SUN Handong

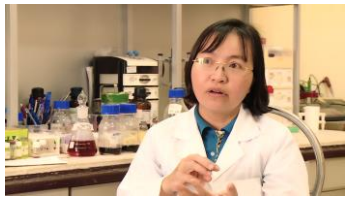
Nguyễn Văn Toàn

Nguyễn Trọng Tâm

Nguyễn Đức Trung

PGS. TS Mai Hồng Hạnh

TS Phạm Văn Nhất



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Dr Soraya Caixeiro

Dr Dhruv Saxena

Thank you for your attention!