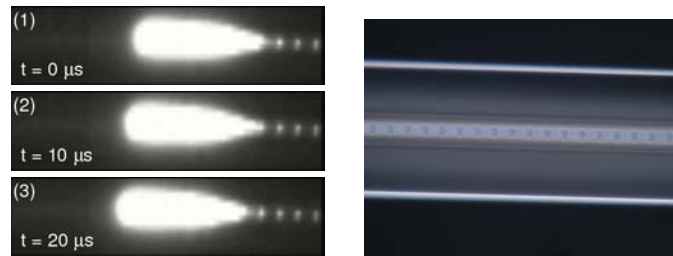


Ultrahigh-speed videography of fiber fuse propagation: a tool for studying void formation

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Slide 1

OVERVIEW

Ultrahigh-speed videography of fiber fuse propagation

Videography

How was the fire-ball captured?

Front void

What is left behind at the fire-ball's position?

Archaeology

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What is told from the photos of left behind?

Slide 3

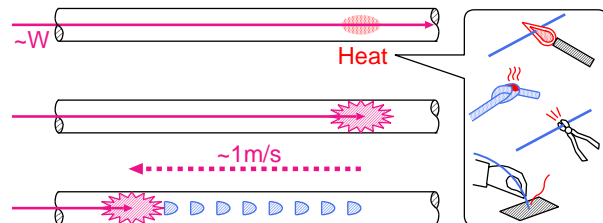
Introduction

Fiber fuse

- Found in 1987 (R.Kashyap & K.J.Blow)
- Optical discharge runs toward the light source leaving periodic voids



Video



Slide 2

Videography

How was the fire-ball captured?

Setup

What is the trap like?

Movie

How its behavior changed with the pumping power?

Analysis

What is found out?

Slide 4

Setup **Shooting condition**

- 4 μ s/frame
- 1 μ s-exposure with ND filters ($\times 16$)
- 128 \times 16 pixels

Diagram illustrating the experimental setup: Fiber Laser (1480nm), ND filter, Zoom lens, and SMF-28 fiber. A graph shows power levels of 9W and 1.5W.

Slide 5

FYI **Current status of high-speed videography**

Todoroki (ECOC 2004 PD) Todoroki (LAT 2005) Bufetov et al. (OFC 2005)

4 μ s/frame	Interval	128 or 70 μ s/frame
1 μ s	Exposure	10 μ s
+ ND filters		+ black illumination
128 \times 16	Pixels	1024 \times 128

Movie 2

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Movie Movie 1

Graph showing intensity profile vs. Distance, $x/\mu\text{m}$.

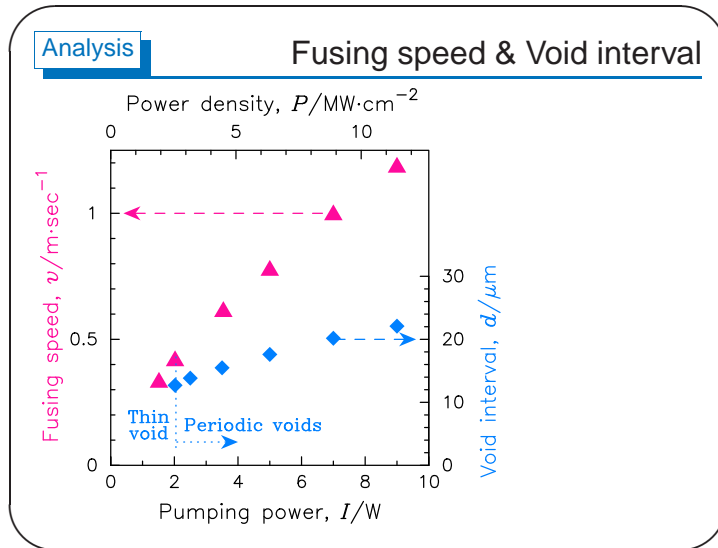
- 4 μ s/frame
- 1 μ s-exposure with ND filters ($\times 16$)
- 128 \times 16 pixels

Slide 6

Analysis

Analysis of voids at different power levels (5.0 W, 3.5 W, 2.0 W, 1.5 W) showing discrete voids and thin voids. Includes velocity values (0.77 m/s, 0.61 m/s, 0.41 m/s, 0.33 m/s) and distance profiles.

Slide 8



Slide 9

Front void

What is left behind at the fire-ball's position?

Photography

How *the samples* were prepared?

Comparison

What is related with *the asymmetry* of the discharge?

Cavity size

How it changes with increasing *the pumping power*?

Slide 11

Videography

How was the fire-ball captured?

Setup

$1\mu\text{s}$ -exposure & **x16 ND** filters helped to catch it.

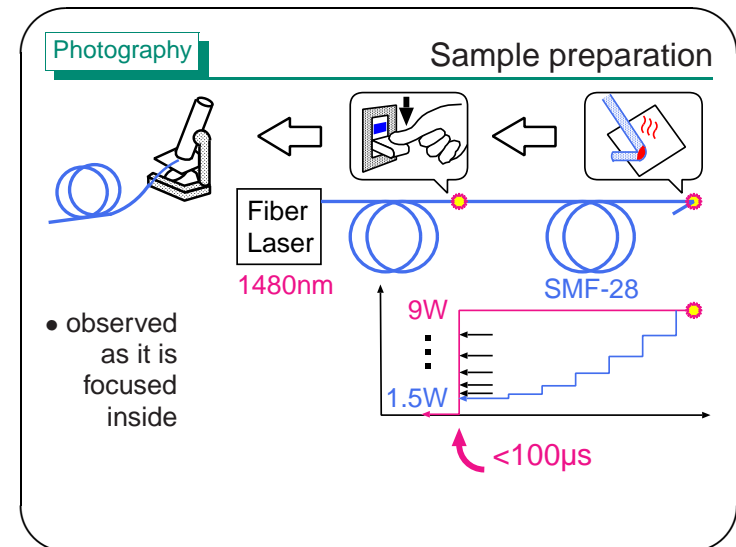
Movie

Pumping with $>2\text{W}$ makes intensity profile **asymmetric**.

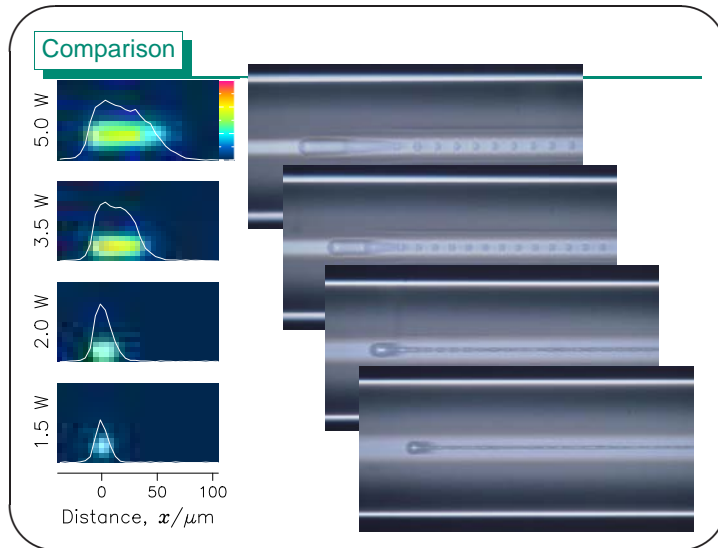
Analysis

Asymmetric optical discharge leaves **periodic** voids.

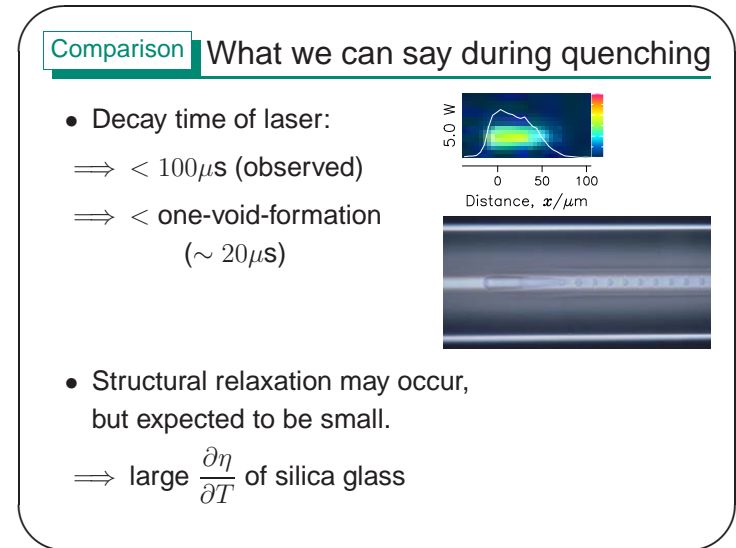
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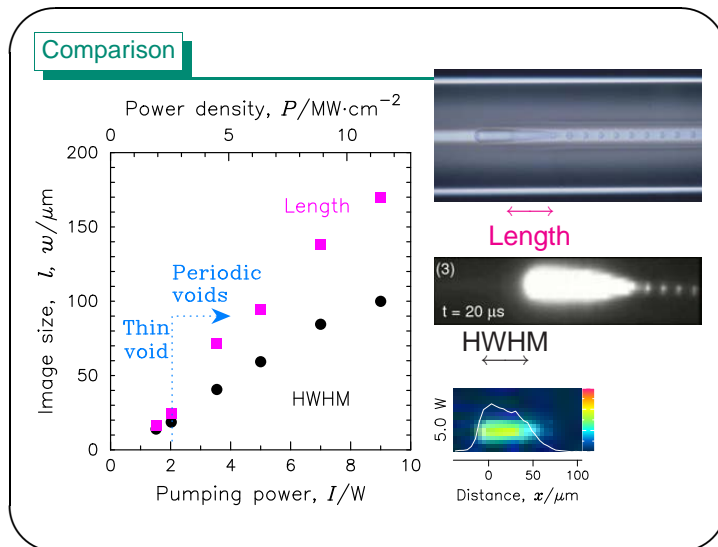
Slide 12



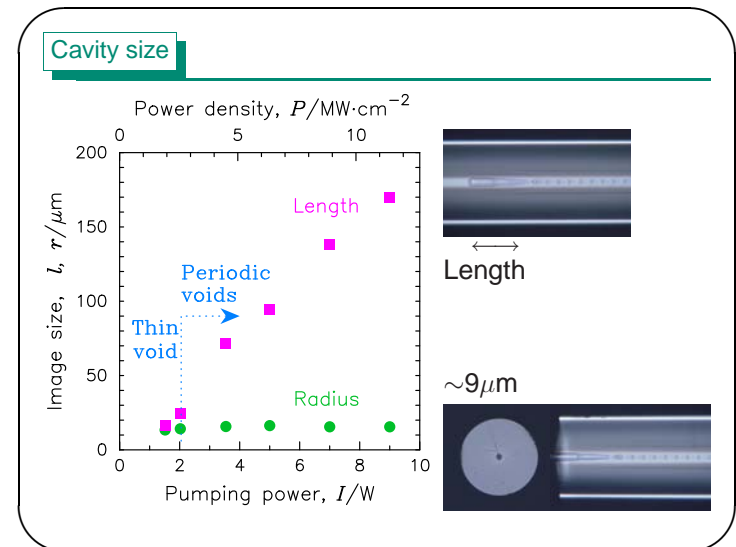
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Slide 15



Slide 14



Slide 16

Front void

What is left behind at the fire-ball's position?

Photography

Prepared by **sudden power cut** after fiber-fusing.

Comparison

Asymmetric discharge leaves a **tailed** void.

Cavity size

Void radius is **constant** & independent of input power.

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Archaeology

What is told from the photos of left behind?

Periodicity

What comes into view considering **periodicity**?

Reconstruction

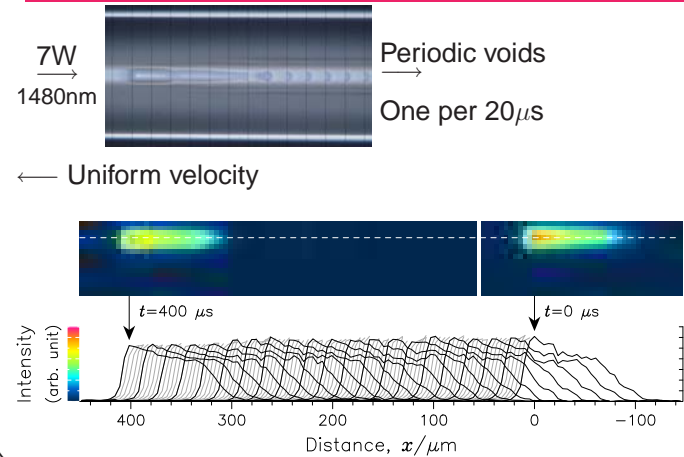
What is extracted from **a series of photographs**?

Mechanism

Why the regular voids look like **bullets**?

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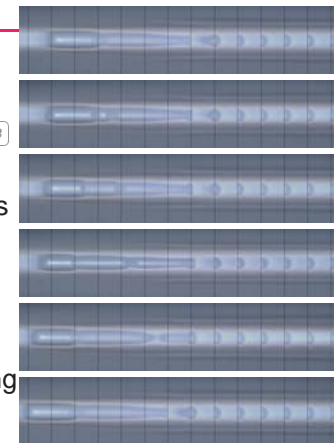
Periodicity



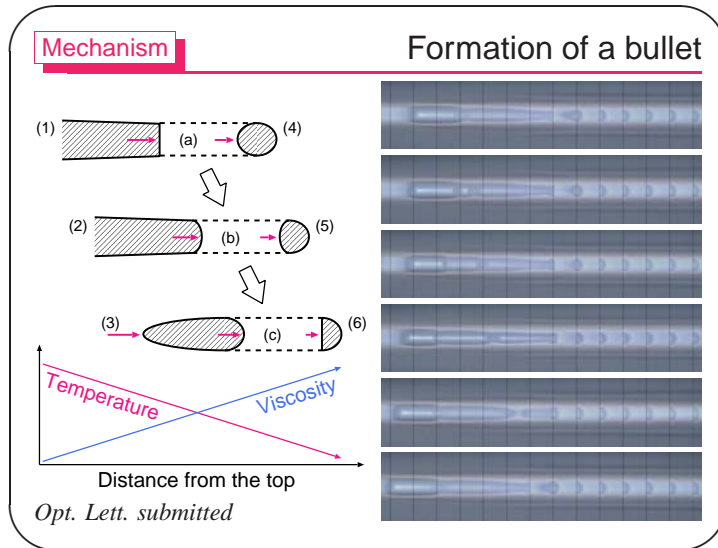
Slide 19

Reconstruction

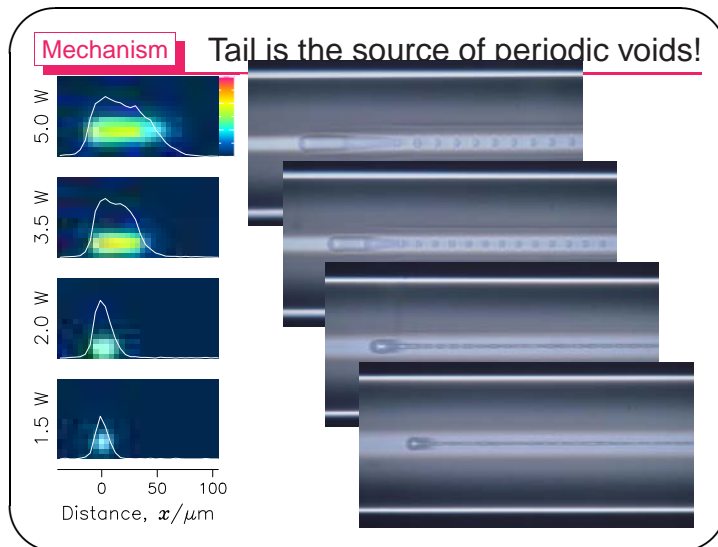
- These are **NOT in-situ**
- but seem that Movie 3 the void casts off its tail
→ one of regular voids
- Assuming that each structure is sufficiently the same as that before quenching



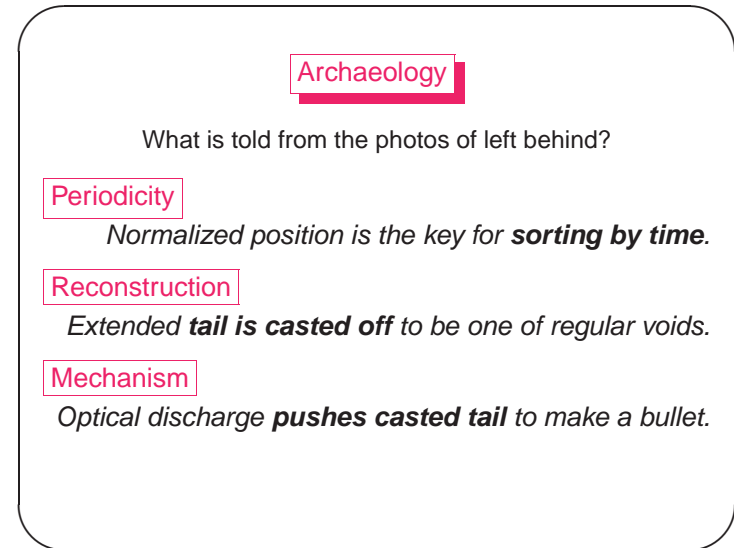
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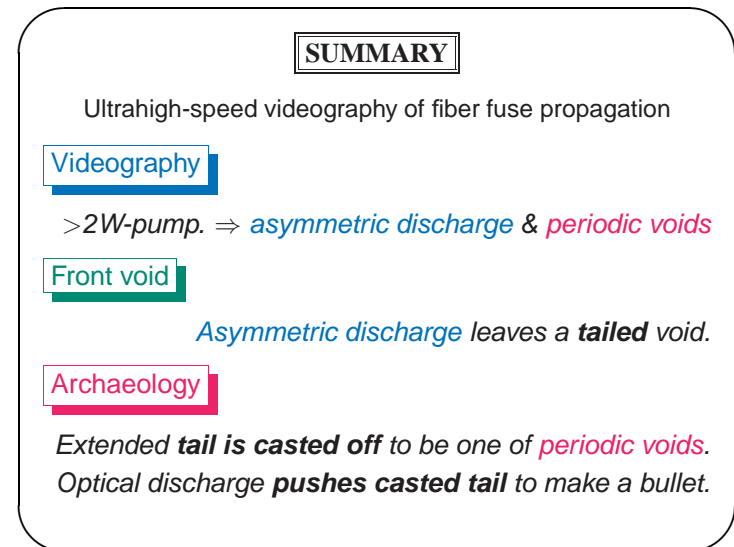
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Slide 23



Slide 24

Acknowledgement

- Mr. Kazuhide HANAKA,
Mr. Akira SAKAMAKI
- Dr. Satoru INOUE

