

Three-dimensional memory and its prospect

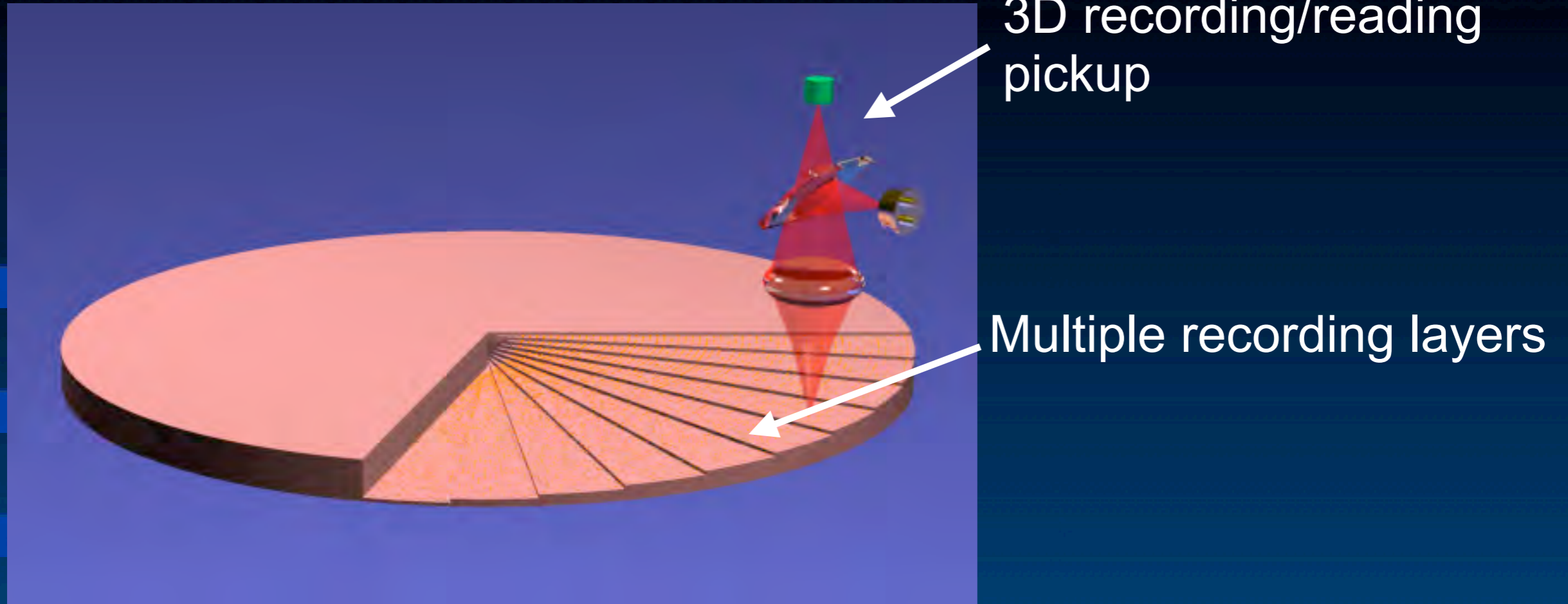
RIKEN

(The Institute of Physical and Chemical Research)

Takuo Tanaka



Three-dimensional multi-layered memory



- Extending the recording space from 2D to 3D.
- Highly compatibility to current optical disks (CD or DVD).
- Removability same as current optical disks.
- Feasibility was checked for multi-layered ROM disk.

(Ichimura, ISOM04, We-E-02)

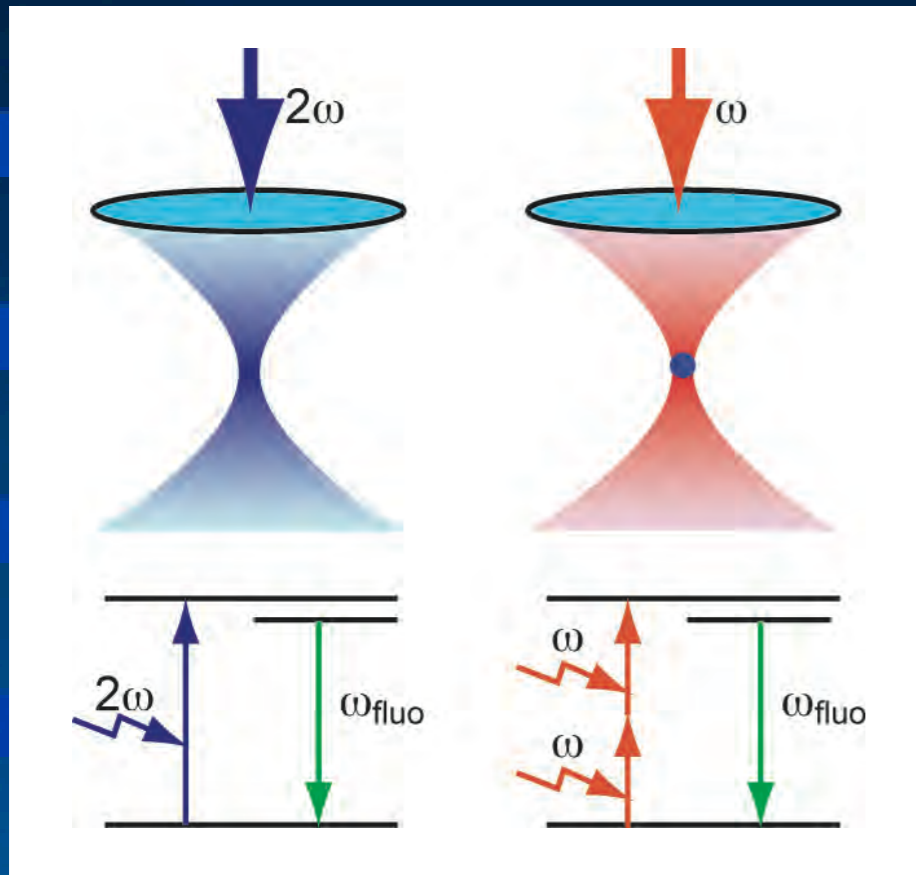


Key technology

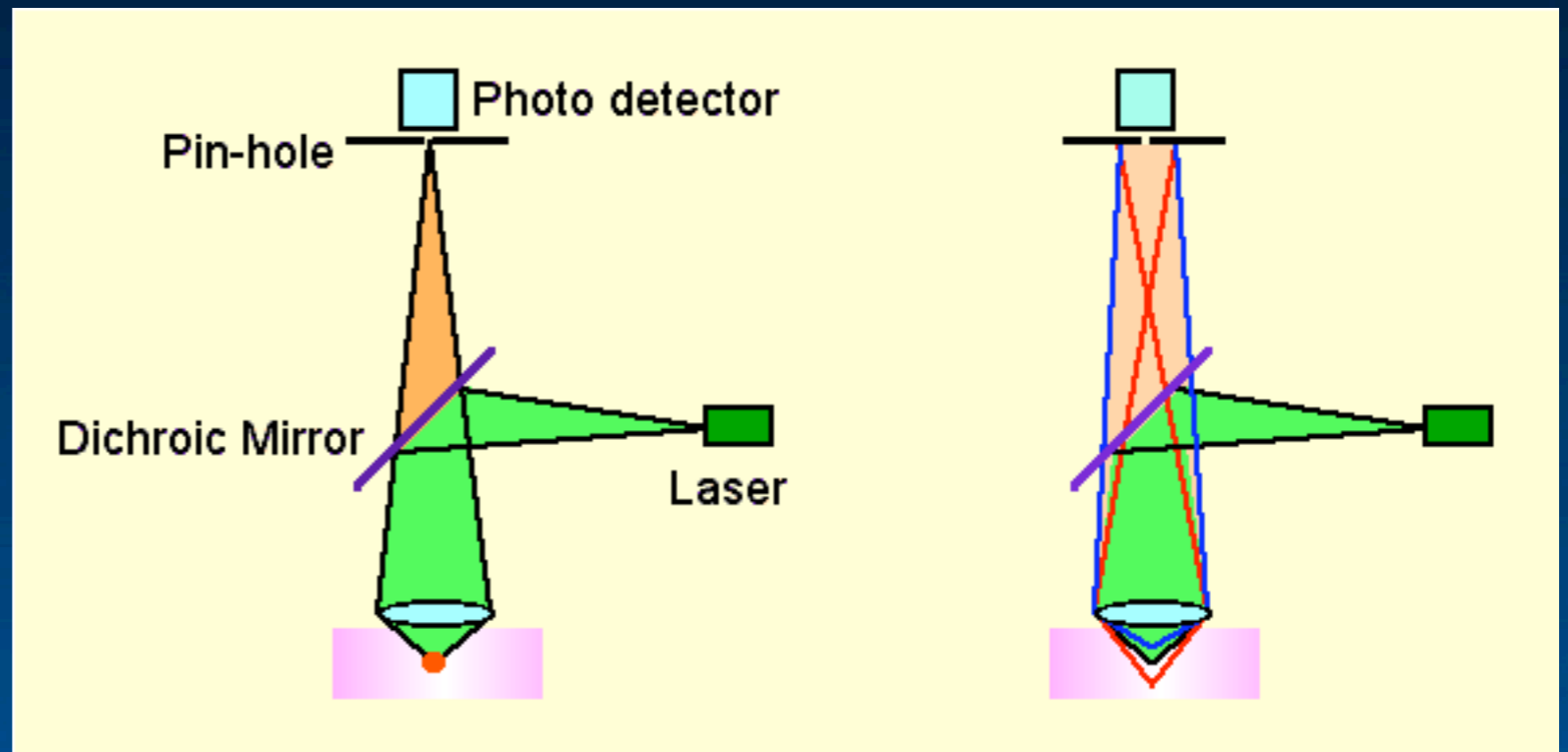
3D recording and reading technique

Two-photon absorption
Confocal microscopy

Keyword is “nonlinearity”

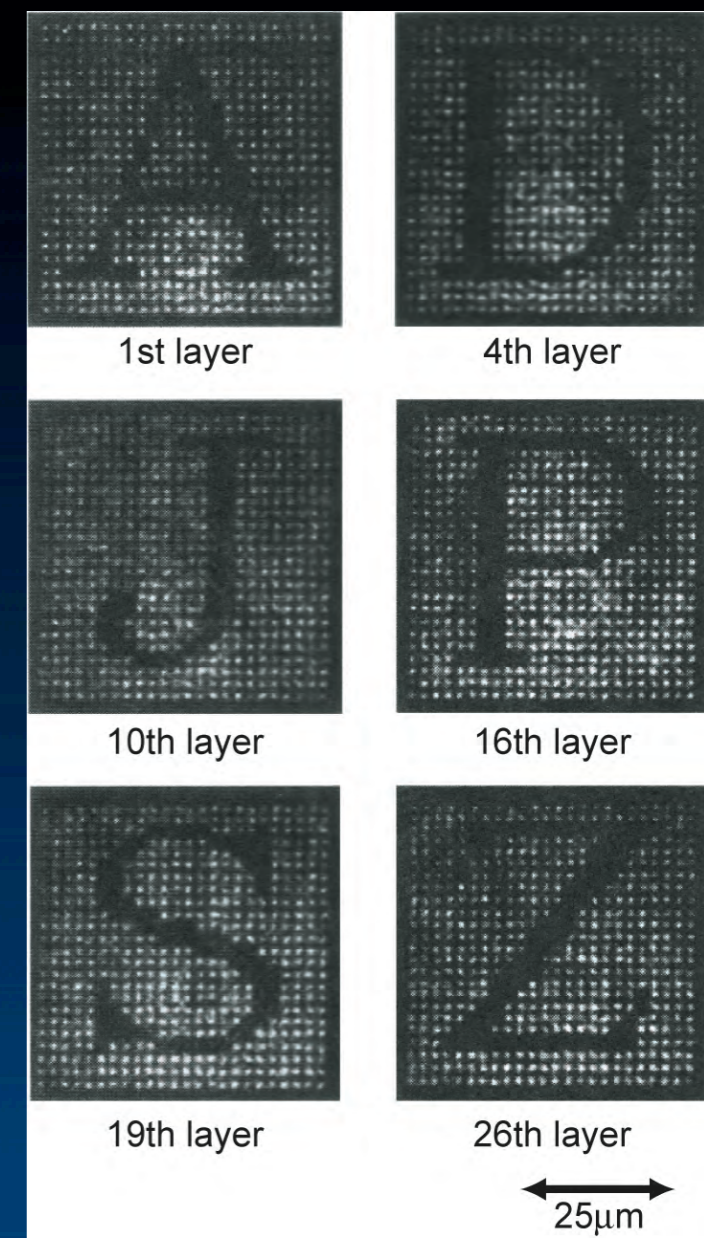
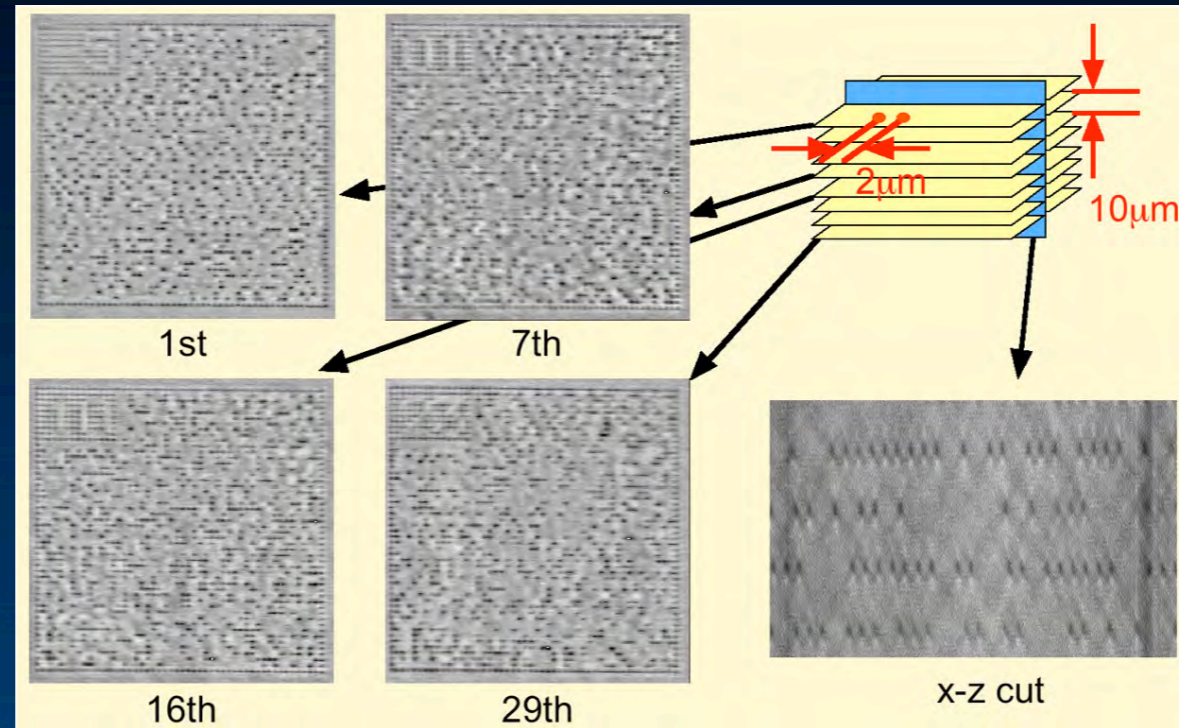
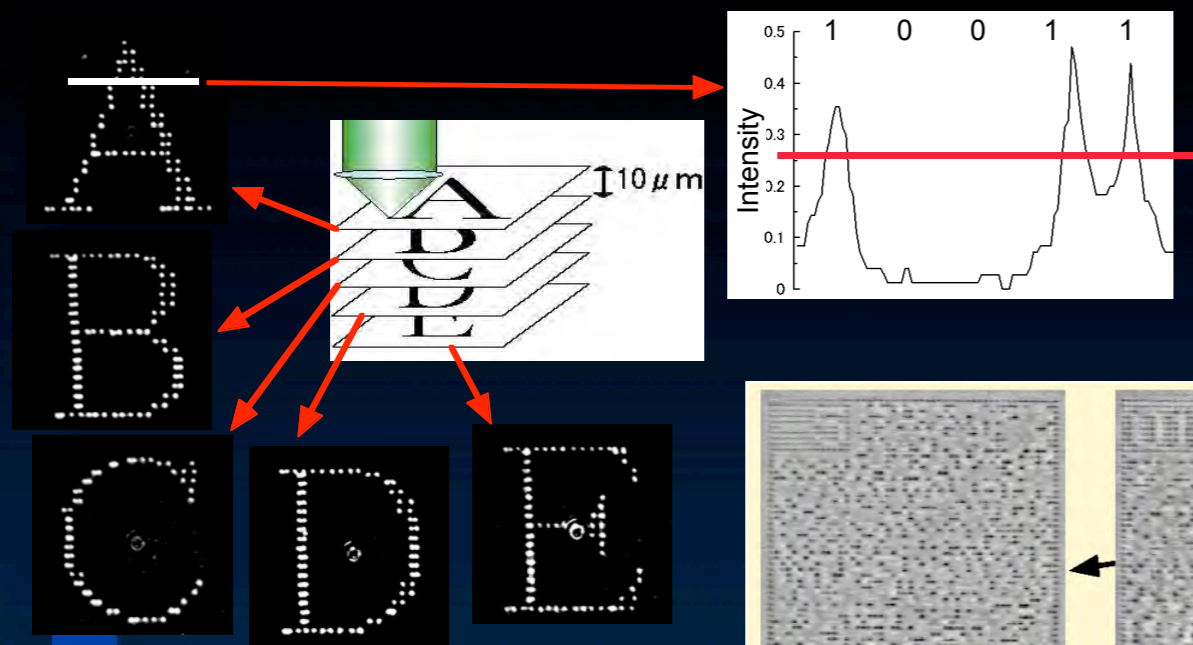


Two-photon absorption



Confocal microscopy





Critical problems

- Light source
 - Small, high-repetition rate, short wavelength f-sec pulse laser
- Recording Material (Disk)
 - Non-linearity, high sensitivity, mass producibility
- New optics design
 - 3D focusing/tracking servo, active aberration correction



Appropriate application

Archive media not only for public data but also private data.

VHS



DVD



analogue vs digital ?
magnetic vs optical ?

Most important point is the difference of dimensions.

1D recording: Tape wound on the reel.

Sequential access

2D recording: Data is on the disk.

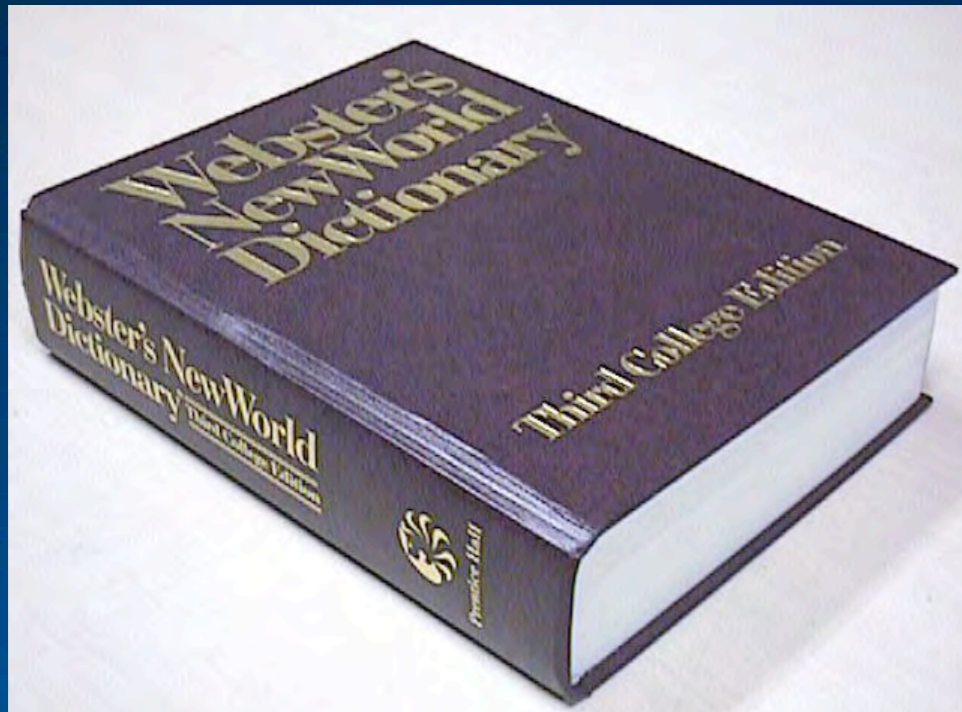
Random access.



Next generation optical storage should have high speed random accessibility as well as large recording capacity.

This can be done by extending the dimension from 2D to 3D.

- “Indexing” and “Paging” is fundamental key techniques for enhancing the access speed.



We are already using the 3D recording as well as indexing and paging !!

