Comments on:

James Woodward

"Levels: What Are They

and What Work Do They Do?"

Levels of analysis

1) Composition

2) Subject matter

3) Abstractness/Coarseness

4) Causal interaction (within and between levels)

Criteria for level selection

1) *Invariance*: causal effect in >1 background

2) *Conditional independence*: some variables can be ignored

3) *Specificity*: cause is not linked to many effects (desirable?)

# Story of a patient and a doctor
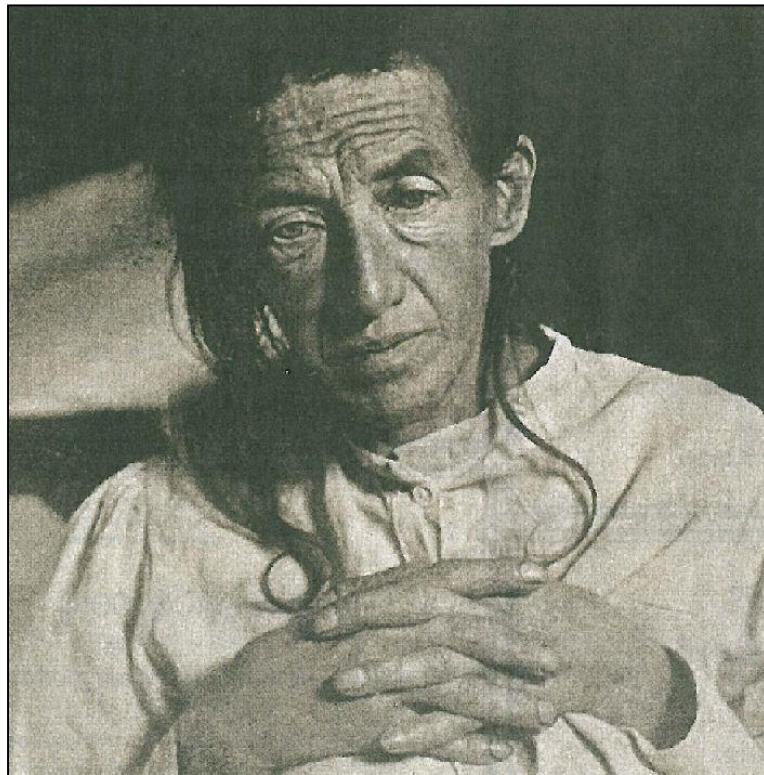
Auguste Deter (1850 - 1906)
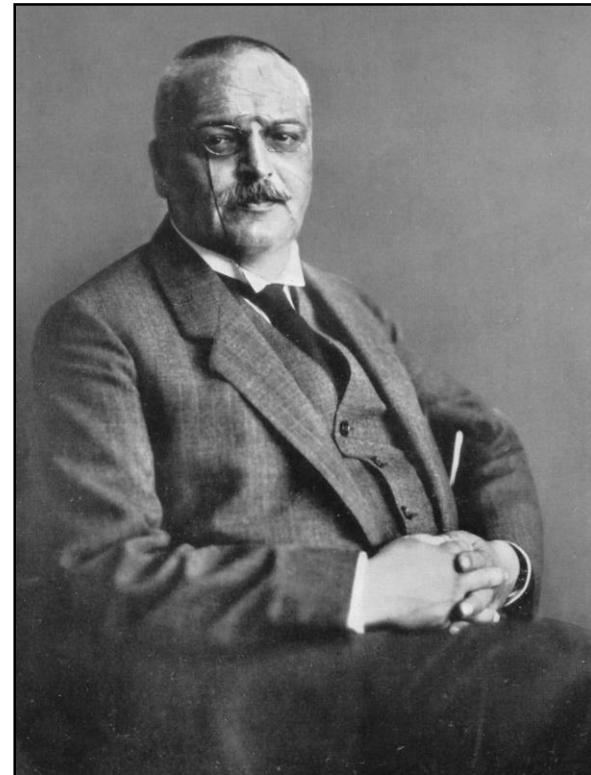
Alois Alzheimer (1864 - 1915)

Story of a brain and a doctor
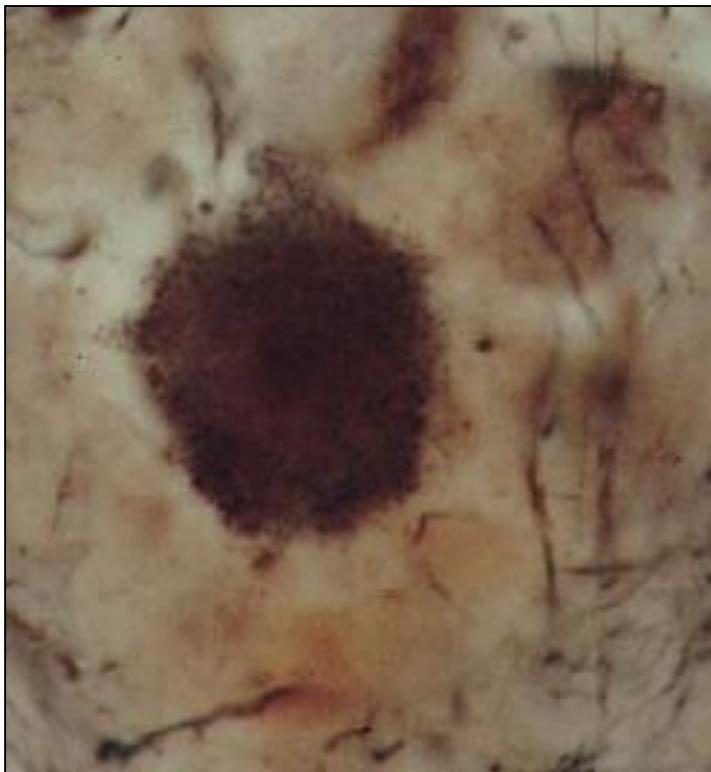
Alzheimer, A. (1907)
A Z P P-G M, 64: 146–148.
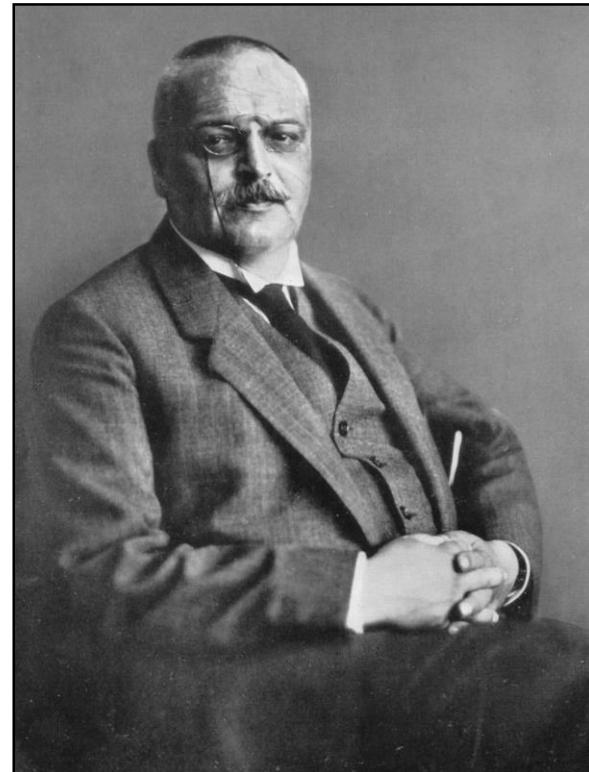
Alois Alzheimer (1864 - 1915)

Levels of AD Research
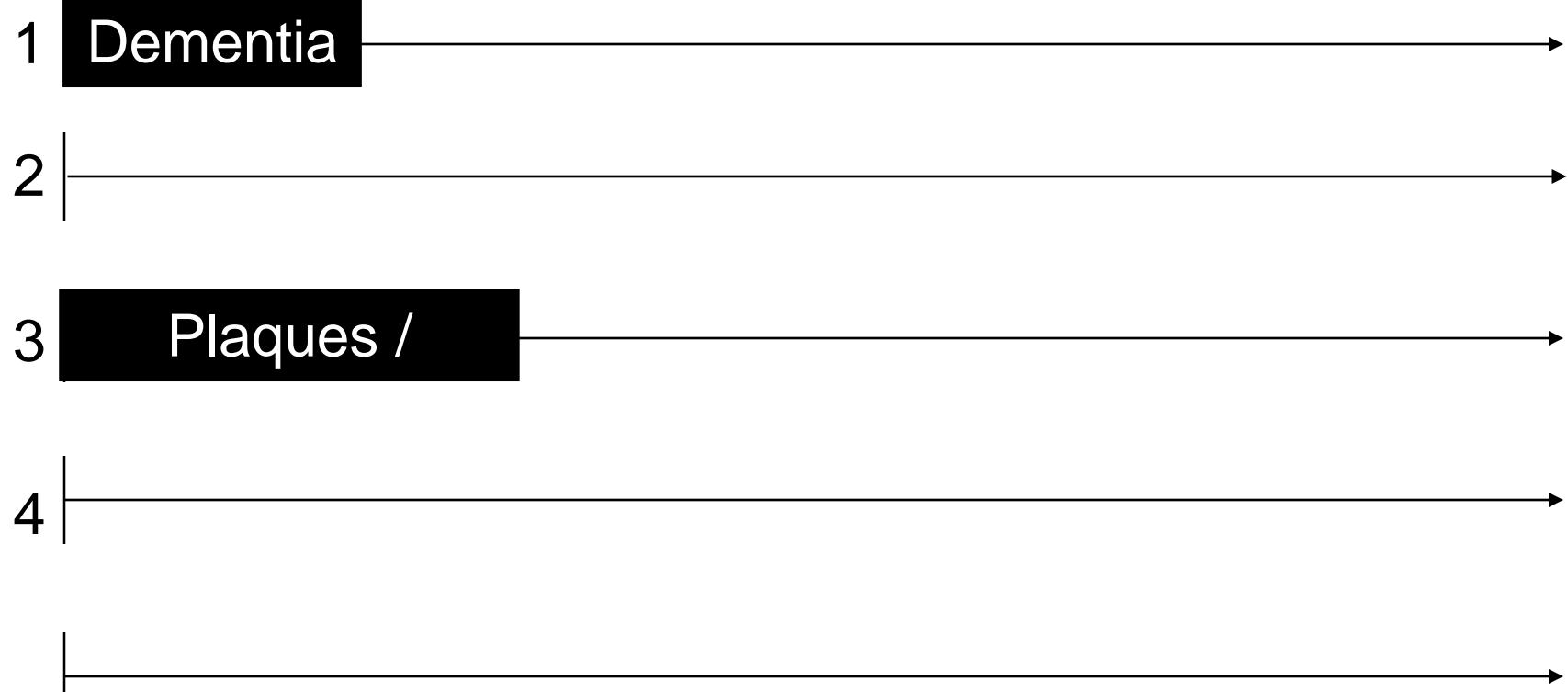
1　**Dementia** ──────────────────▶

2　├──────────────────▶

3　**Plaques /** ──────────────▶

4　├──────────────────▶

├──────────────────▶

1907

Levels of AD Research

1 **Dementia** ———————————————————————→

2 —————————————— **Temporal** —————————→

3 **Plaques /** ———————————————————————→

4 ———————————————————————————————→

———————————————————————————————→

1907

Levels of AD Research

1 | **Dementia** ────────────────────────────→

2 | ──────────── **Temporal** ──── **Acetylcholin** →

3 | **Plaques /** ────────────────────────→

4 | ──────────────────────────────────→

──────────────────────────────────→

1907

Levels of AD Research

1 **Dementia** ────────────────────────────────►

2 ──────────────── **Temporal** ──────── **Acetylcholin** ►

3 **Plaques /** ──────────────── **β-Amyloid** ──────►

4 ──►
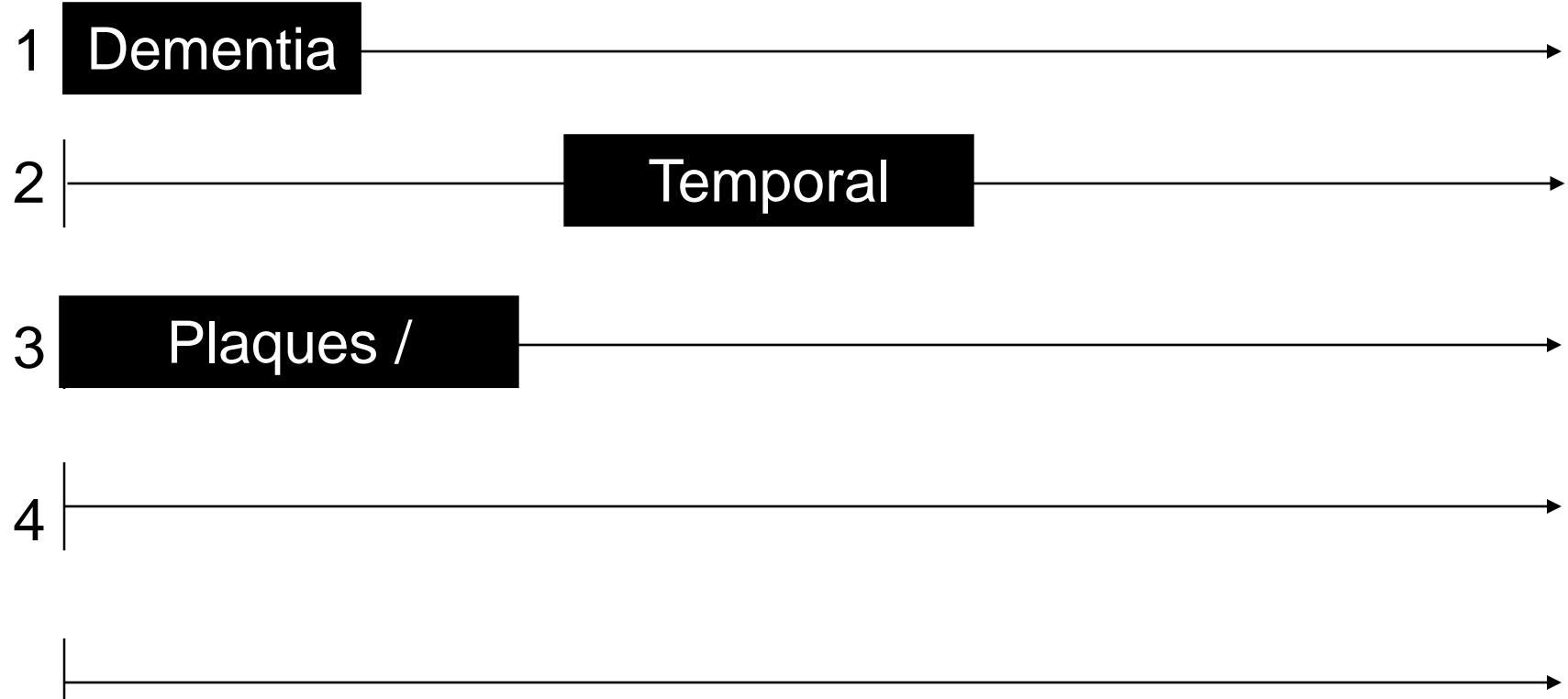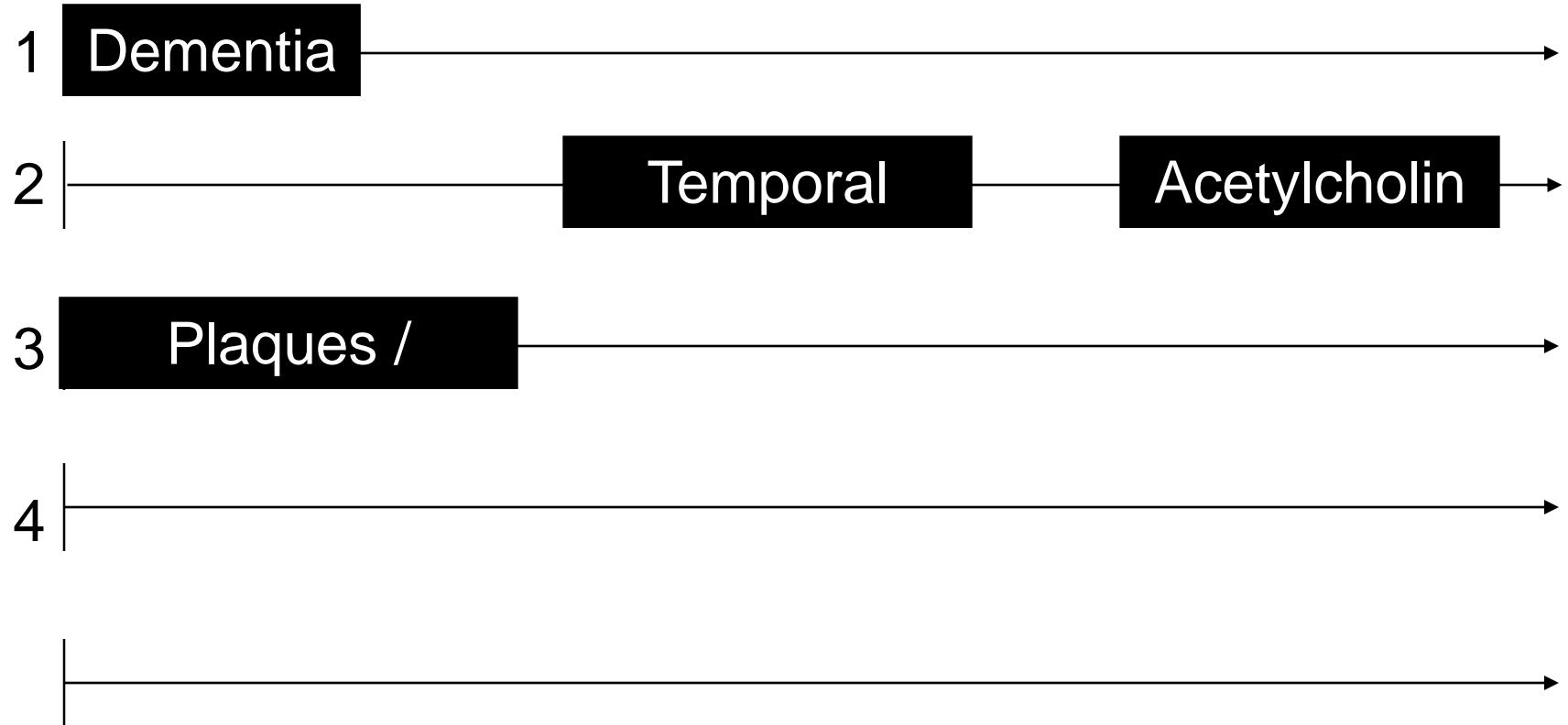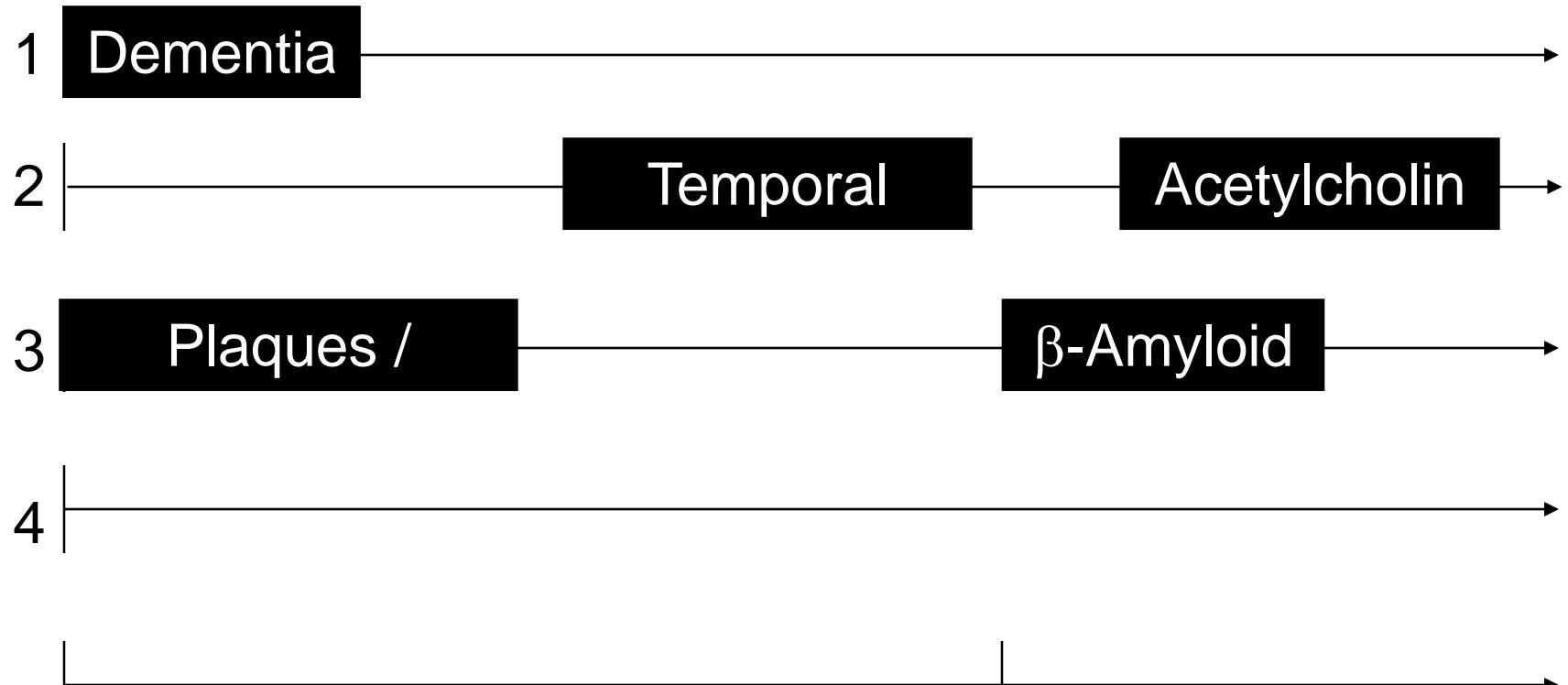
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1907   1984

Levels of AD Research

1 | **Dementia** ⟶

2 | **Temporal** **Acetylcholin** ⟶

3 | **Plaques /** **β-Amyloid** ⟶

4 | **Chr 21,14,1** ⟶
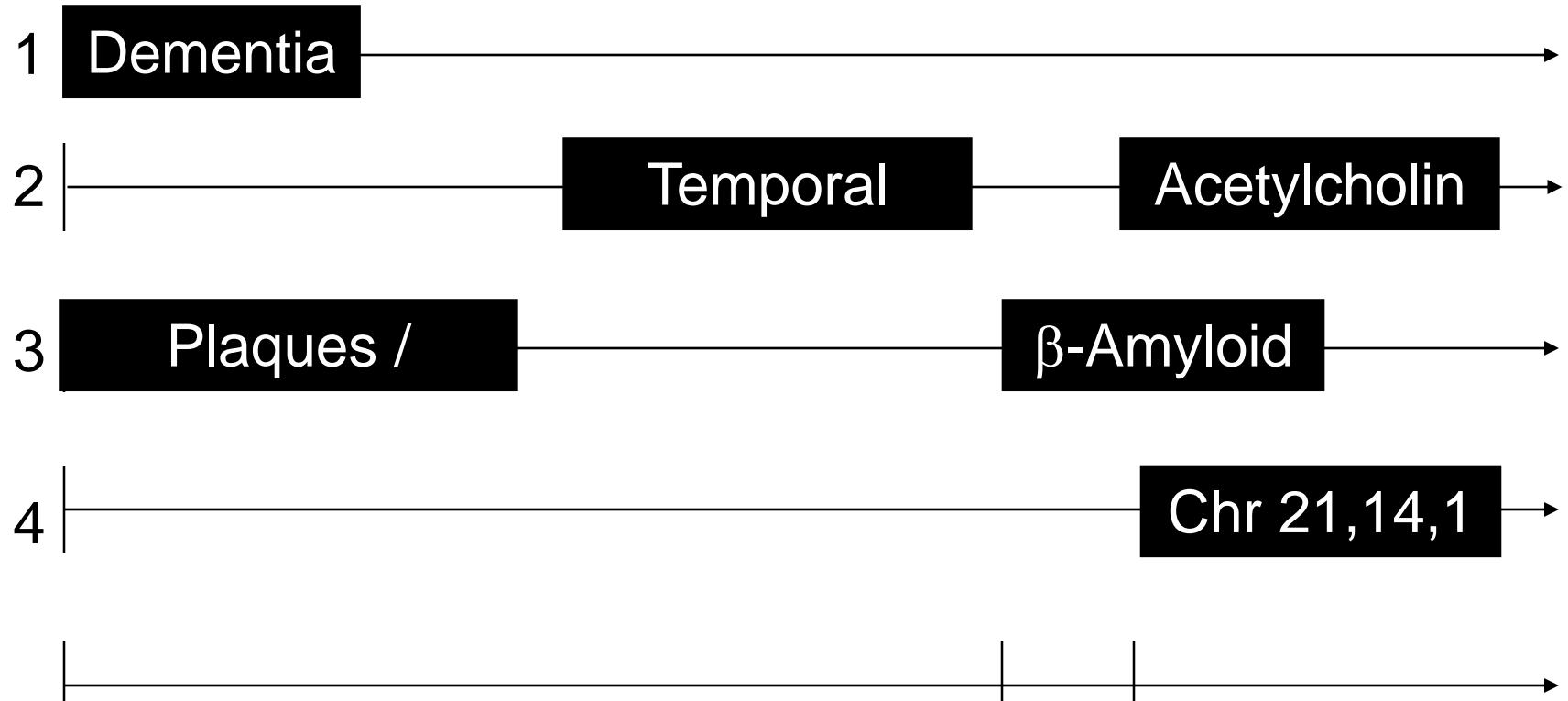
1907   1984 '87

Levels of AD Research

1 **Dementia** →

2 **Temporal** **Acetylcholin** →

3 **Plaques /** **β-Amyloid** **PS** →

4 **Chr 21,14,1** →

1907   1984 '87   '92   '95

Levels: Subject matter

1	Dementia
2	Temporal	Acetylcholin
3	Plaques /	β-Amyloid	PS
4	Chr 21,14,1

1907   1984 '87   '92   '95

Levels: Abstractness

1 **Dementia** →

2 **Temporal**   **Acetylcholin** →

3 **Plaques /**   **β-Amyloid**   **PS** →

4 **Chr 21,14,1** →

1907   1984 '87   '92   '95

Levels: Composition

1 **Dementia** →

2 **Temporal**   **Acetylcholin** →

3 **Plaques /**   **β-Amyloid** **PS** →

4 **Chr 21,14,1** →

1907   1984 '87   '92   '95
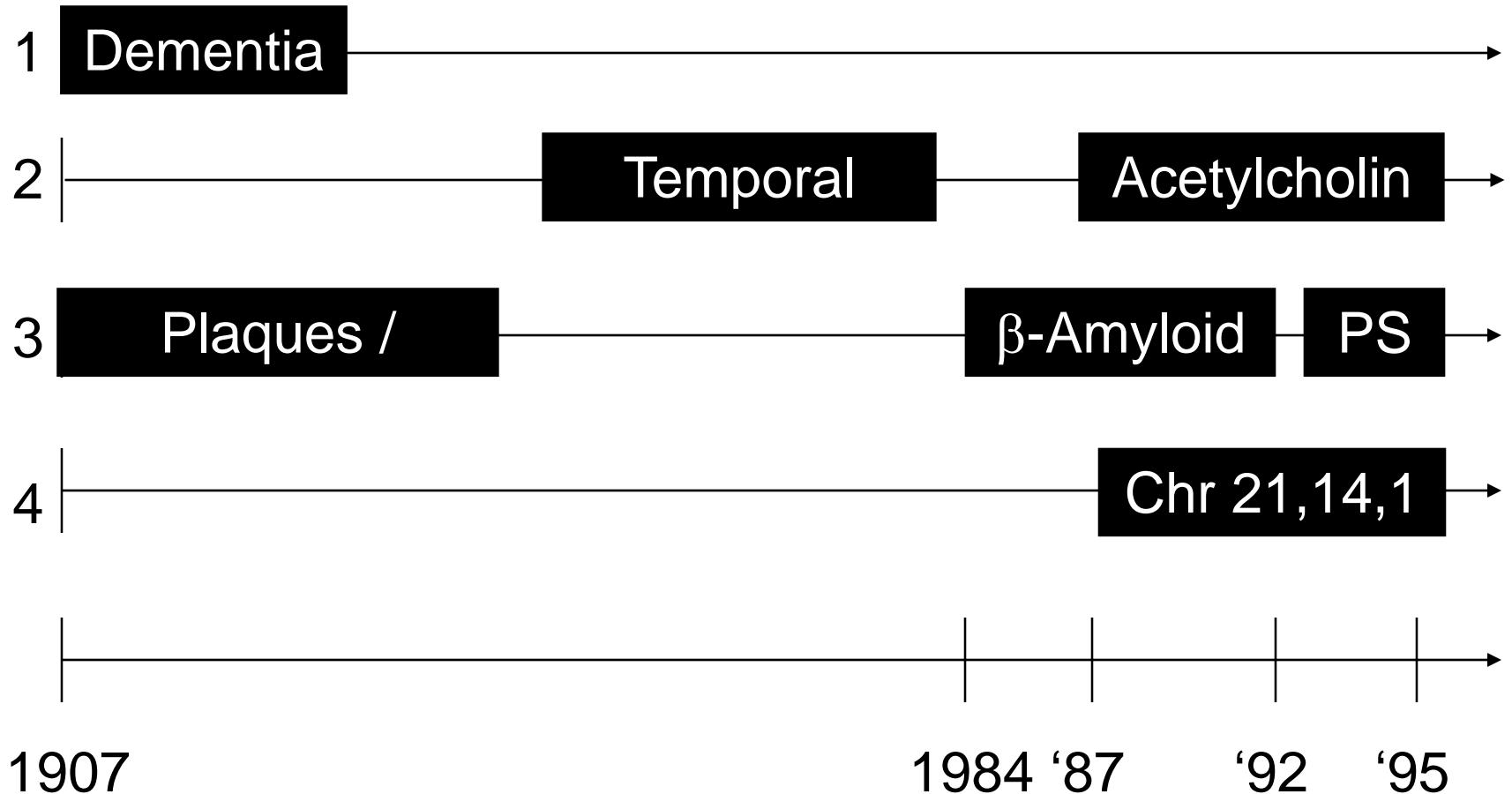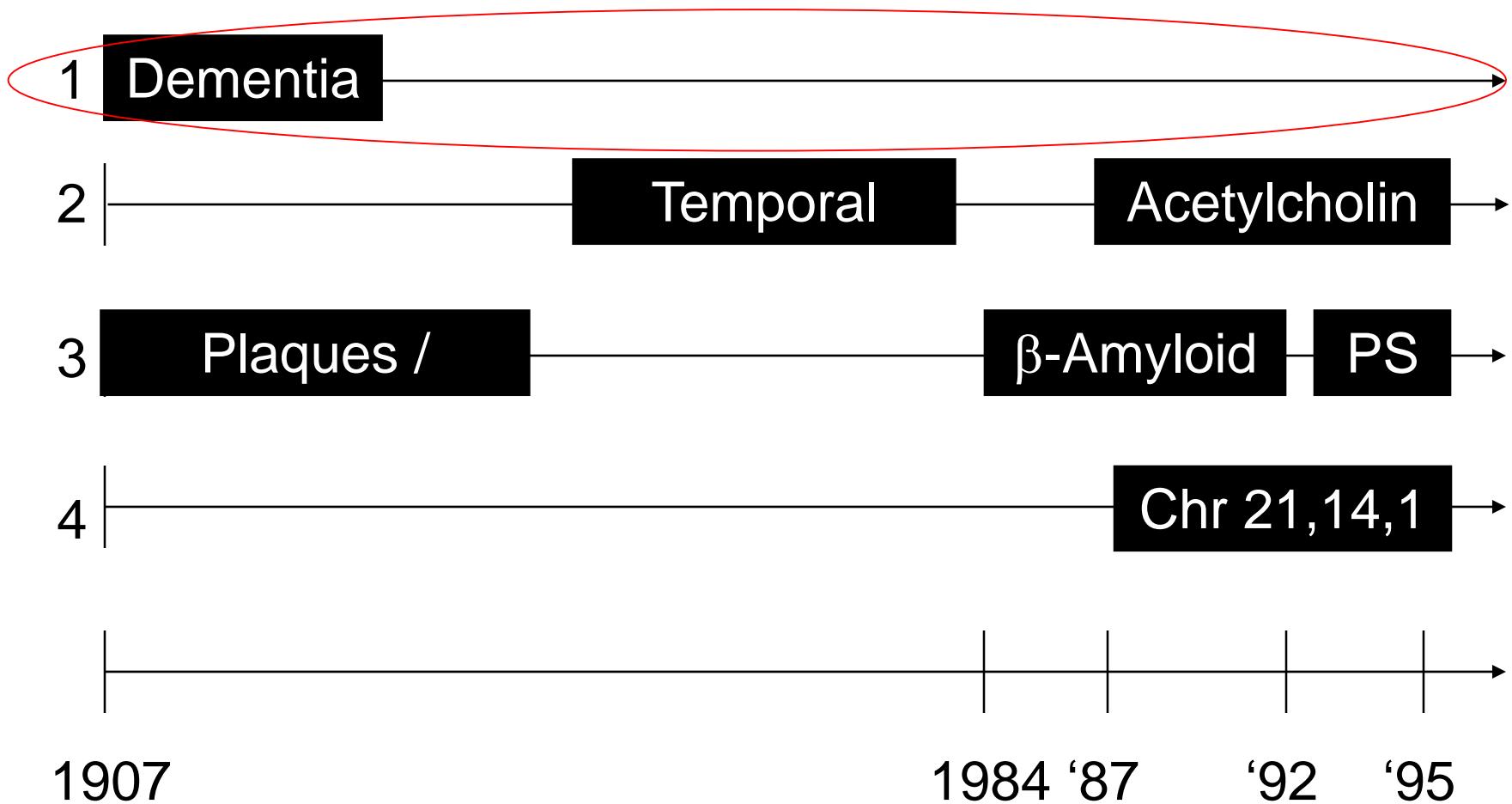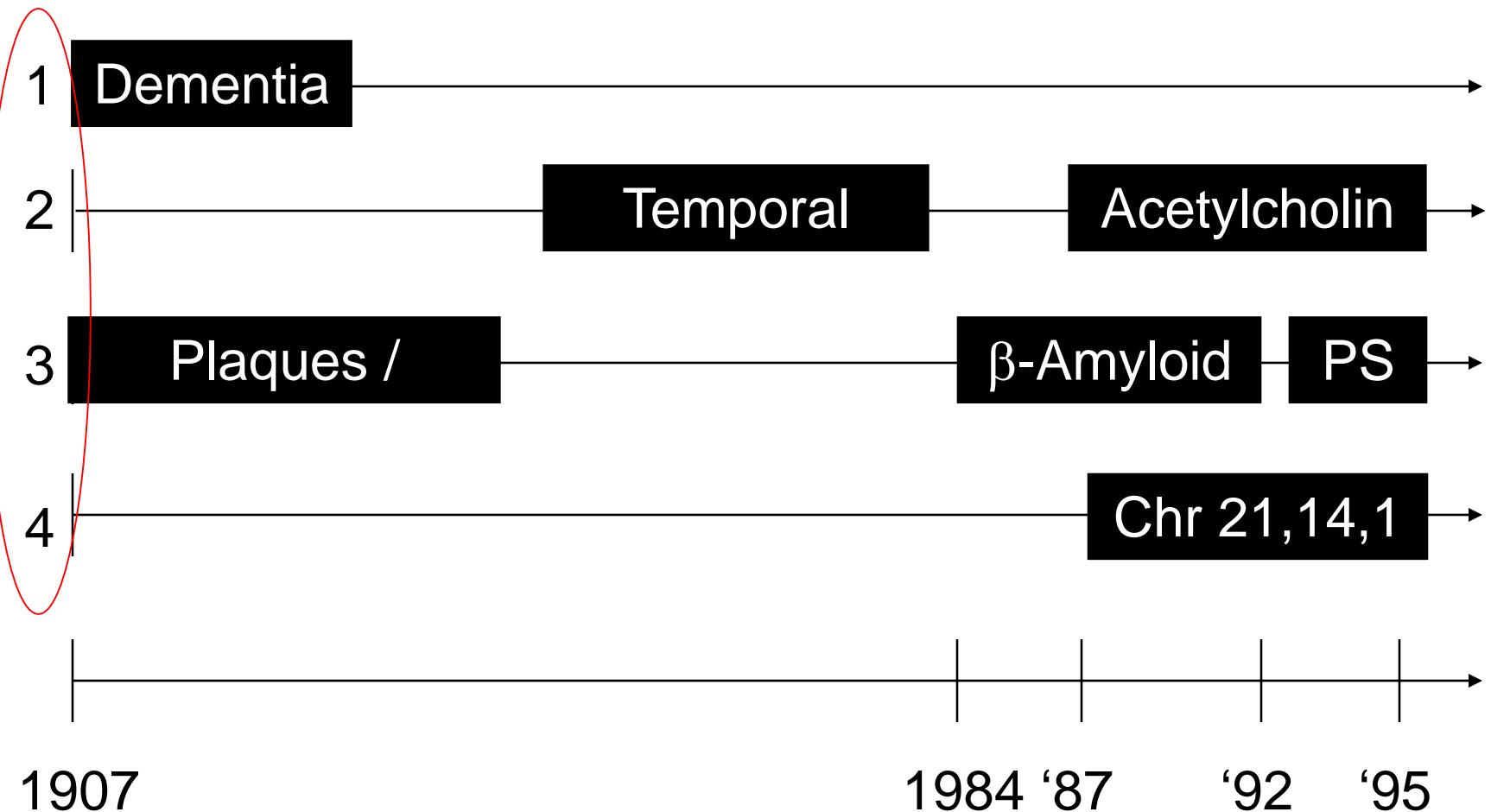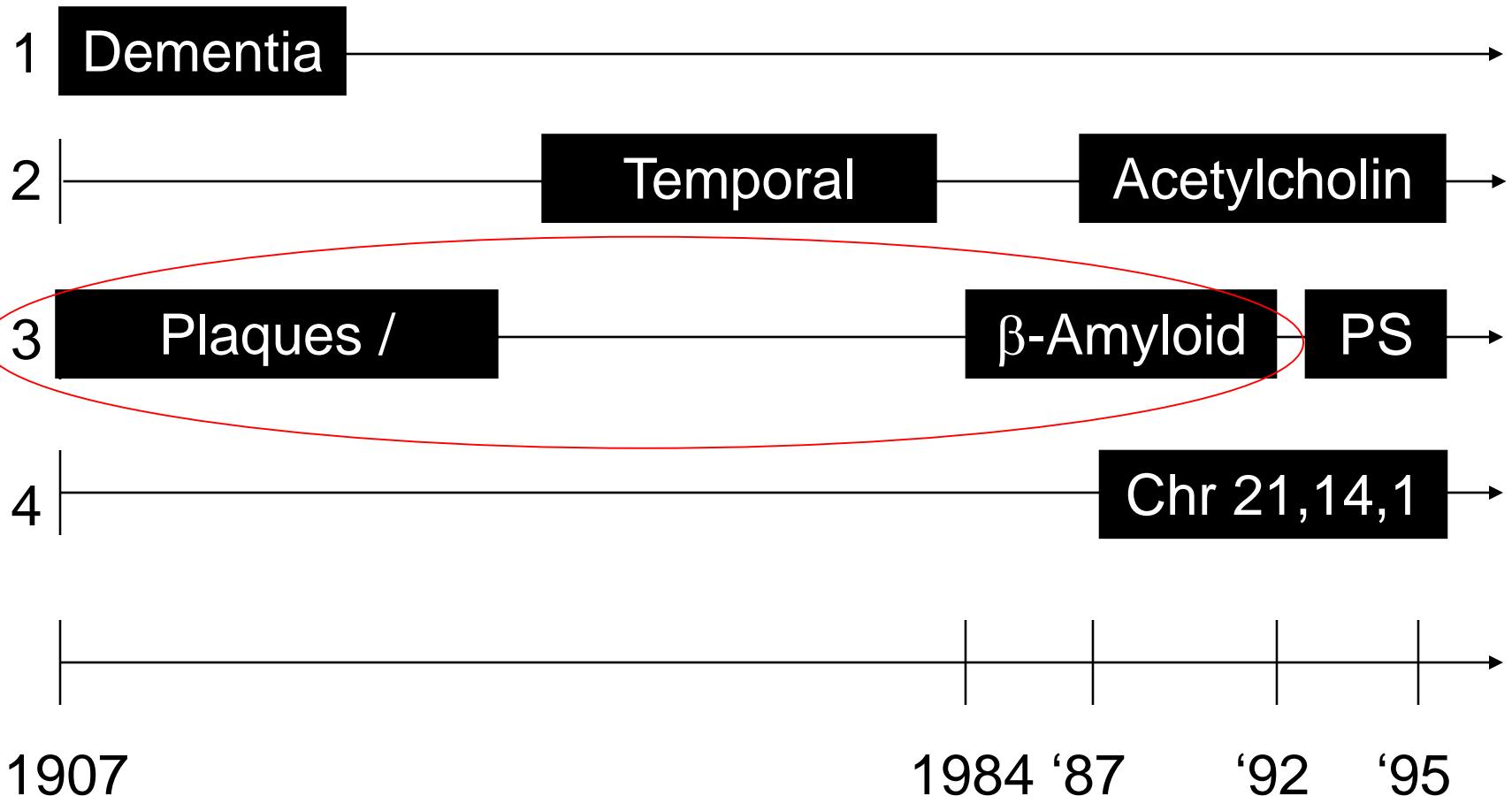
Levels: Composition
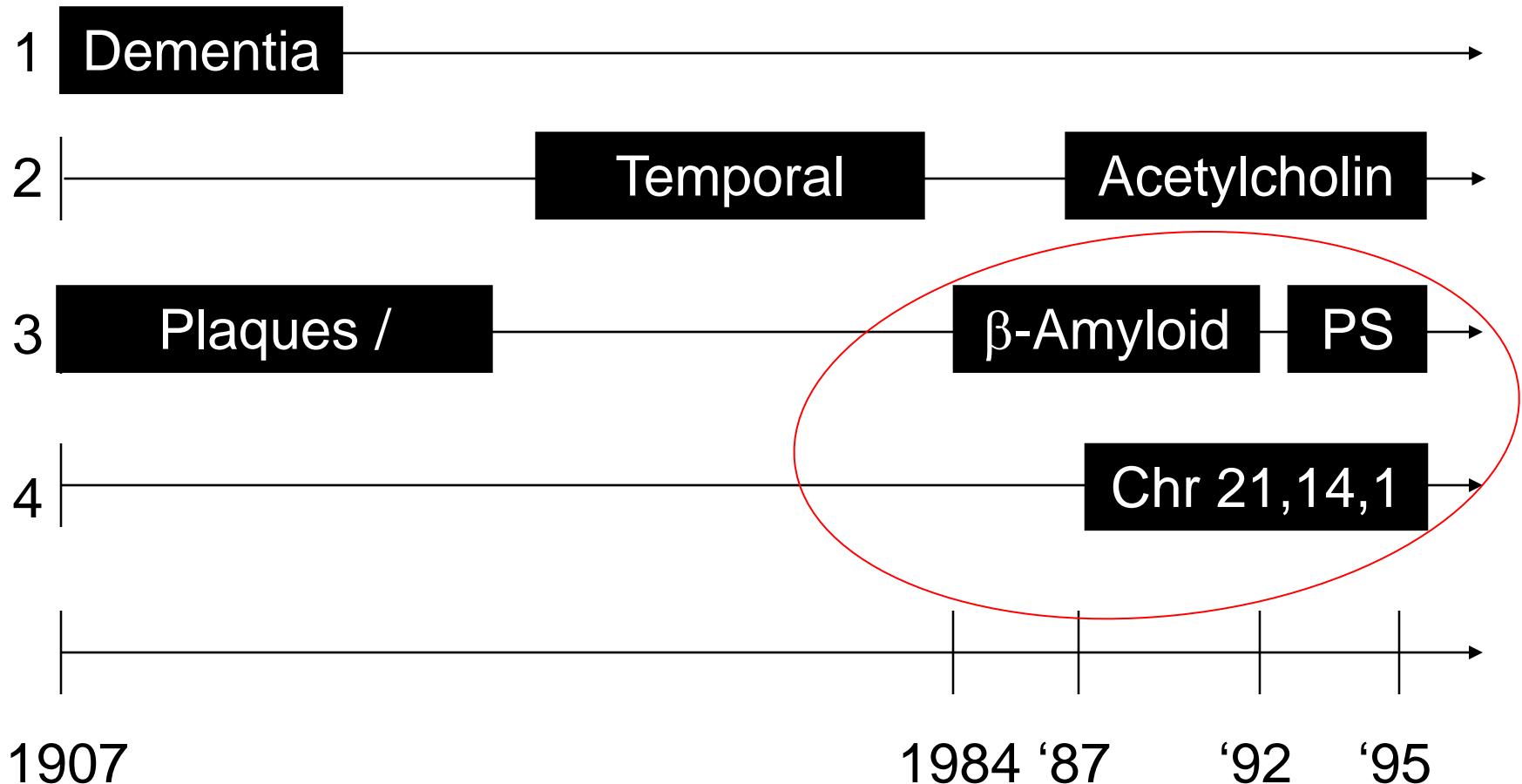
Levels: Causal interaction

1 | Dementia →

2 | Temporal | Acetylcholin →

3 | Plaques / | β-Amyloid | PS →

4 | Chr 21,14,1 →

1907

- 3% AD inheritance
- Transgenic mice

1984 '87 '92 '95

Criteria: Invariance

1   **Dementia** →

2   **Temporal**   **Acetylcholin**   *

3   **Plaques /**   **   **β-Amyloid**   **   **PS**

4   **Chr 21,14,1**   ***

1907   1984 '87   '92   '95
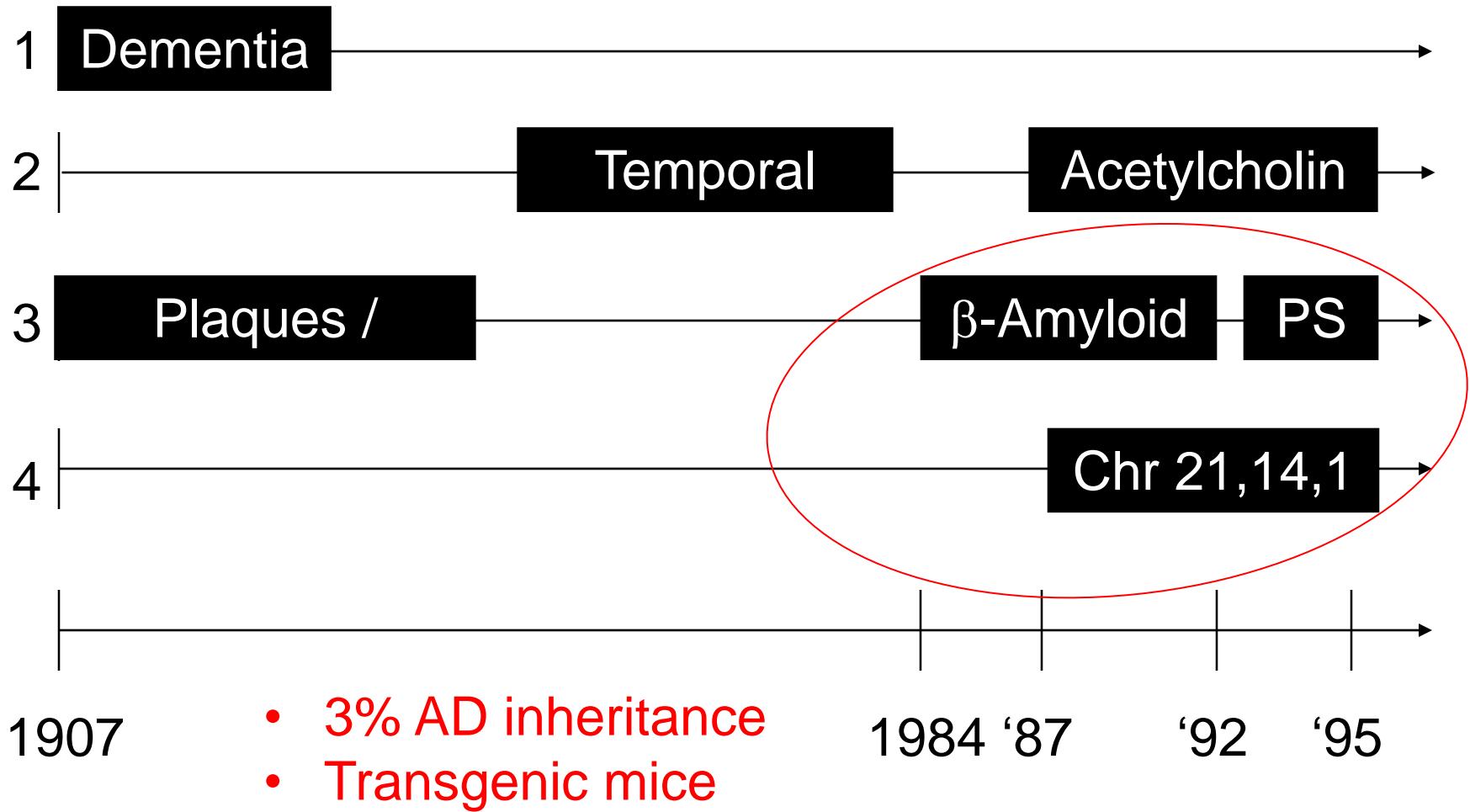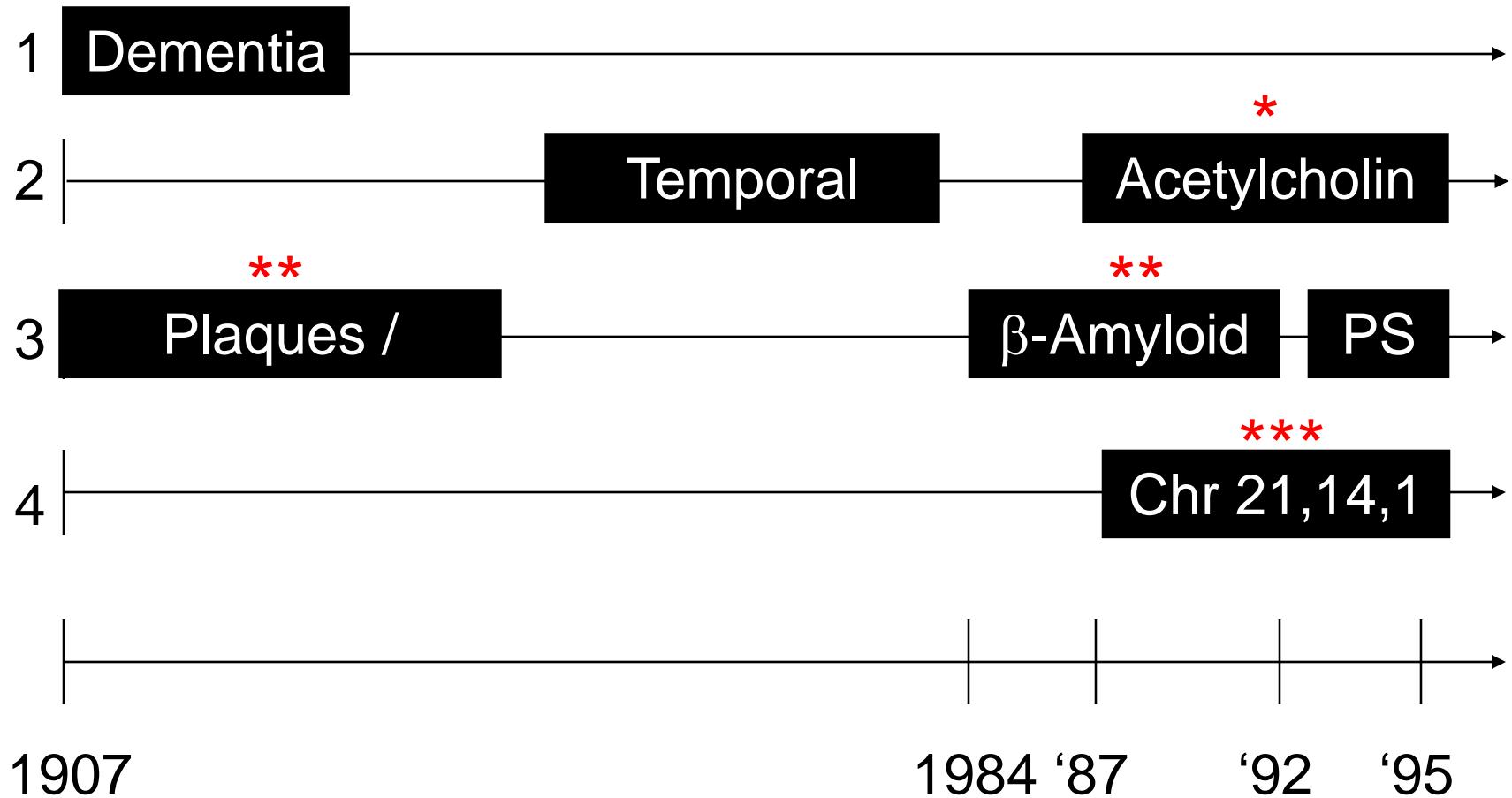
Criteria: Conditional Independence

Criteria: Specificity

1 Dementia ——————————————————————→

2 | ——— Temporal ——— * Acetylcholin →

3 Plaques / ** ——— β-Amyloid PS →

4 | ——— *** Chr 21,14,1 →

1907   1984 '87   '92   '95