Object recognition 3

Visual cognition theories

Feature detection in object recognition

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Outline

1. Critical comments on existing theories, in visual cognition, for how people recognize objects.

2. Features

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Treisman & Kanwisher 1998 Perceiving visually presented objects: recognition, awareness, and modularity. *Current Opinion in Neurobiology*.

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How do we recognize objects? What are the theories? The central controversies in the field have been dichotomies:
Parts vs. whole
Structural vs. viewpoint-dependent
Conscious vs. unconscious
Perception vs. action
Dorsal vs. ventral

Lots of papers have accumulated evidence bearing on these issues, showing differences along these scales between tasks. In some cases patients reveal dissociations. These dimensions are real; there are data to be explained.

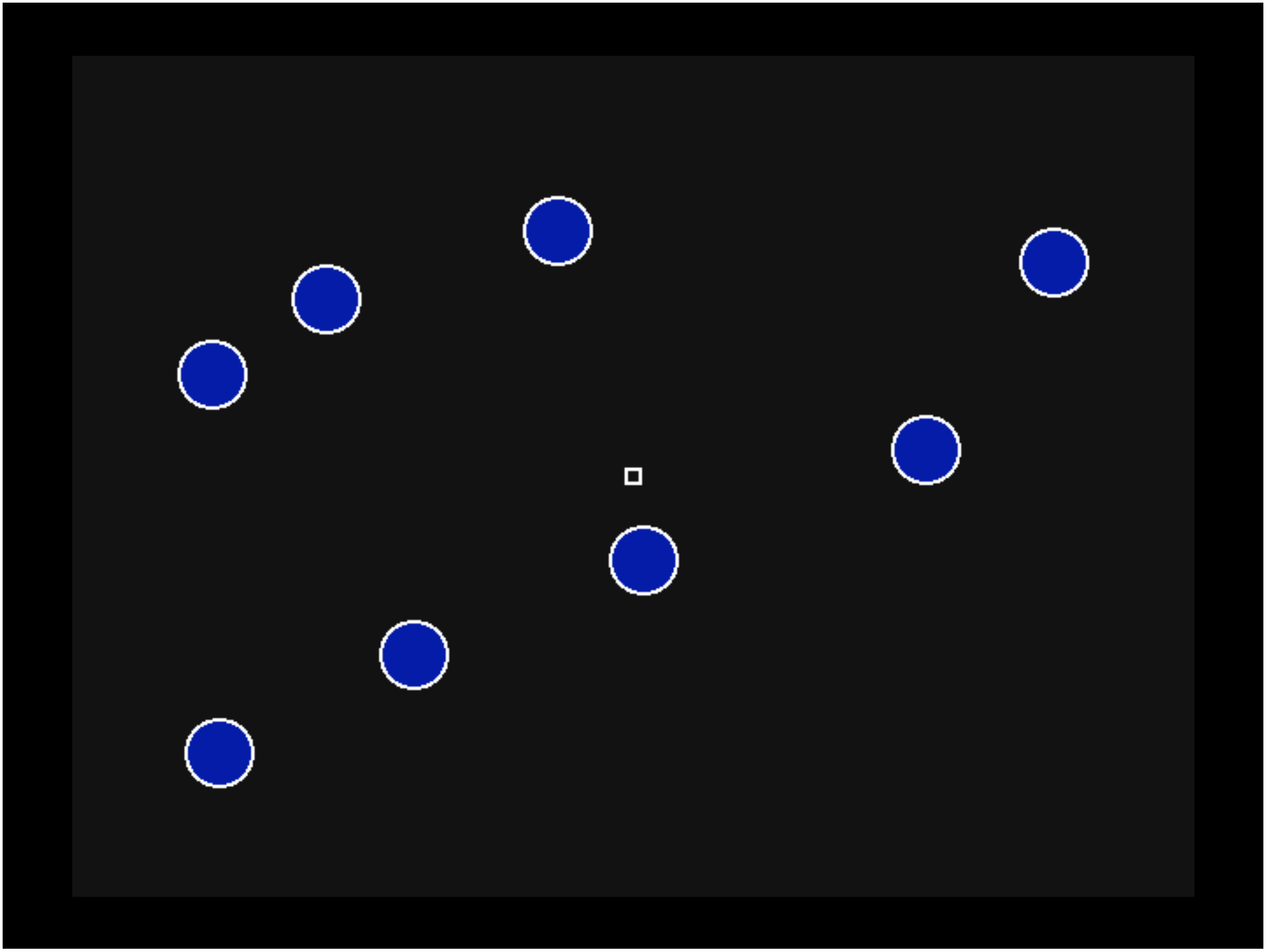
However, while initial positions were at either ends of the dichotomies, everyone has since drifted to moderate views that allow for intermediate positions or combinations of both extremes. As a consequence, no one is wrong. Since no one is wrong, one may well wonder whether the intermediate positions that embrace the whole gamut are testable scientific theories. Can they be refuted?

Except for part/whole in face recognition, these theories haven't helped much in explaining everyday object recognition.

Treisman & Kanwisher 1998 Perceiving visually presented objects: recognition, awareness, and modularity. *Current Opinion in Neurobiology*.

Priming, matching, and repetition blindness are all object-specific, yet invariant across views.

Object files (Pylyshyn, multiple object tracking)



Treisman & Kanwisher 1998 Perceiving visually presented objects: recognition, awareness, and modularity. *Current Opinion in Neurobiology*.

“Wolfe (1998) has collected surprising evidence that previously attended object tokens revert to a similar unstructured state once attention is withdrawn, concluding that, ‘Vision exists in the present tense. It remembers nothing.’”

Treisman & Kanwisher 1998 Perceiving visually presented objects: recognition, awareness, and modularity. *Current Opinion in Neurobiology*.

Modularity

Modularity vs. consciousness

There is much evidence of modularity in the brain, in which some areas seem to know things that other areas don't. Viewing the brain as a machine, this is an old familiar result from the nineteenth century, and a perfectly reasonable way to build a brain. However, if we are talking about the human brain, then the modularity challenges our intuitions about consciousness.

Ned Block distinguishes between phenomenal consciousness and access consciousness. Phenomenal consciousness consists of subjective experience and feelings. *Access consciousness* consists of that information globally available in the cognitive system for the purposes of reasoning, speech and high-level action control. The key word is "globally". Our intuition is that information should never be inconsistent among different parts of the same brain, or different aspects of our behavior.

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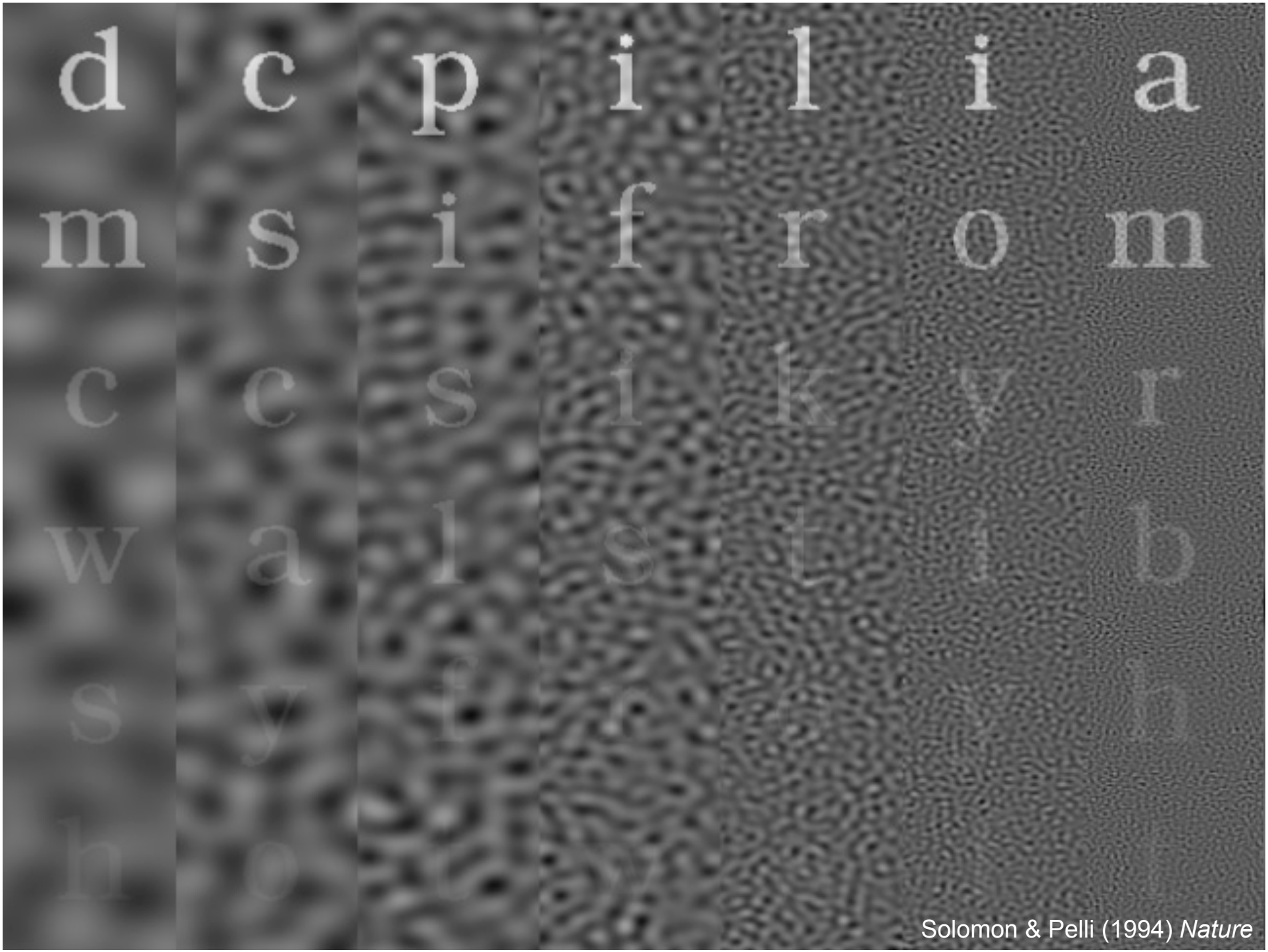
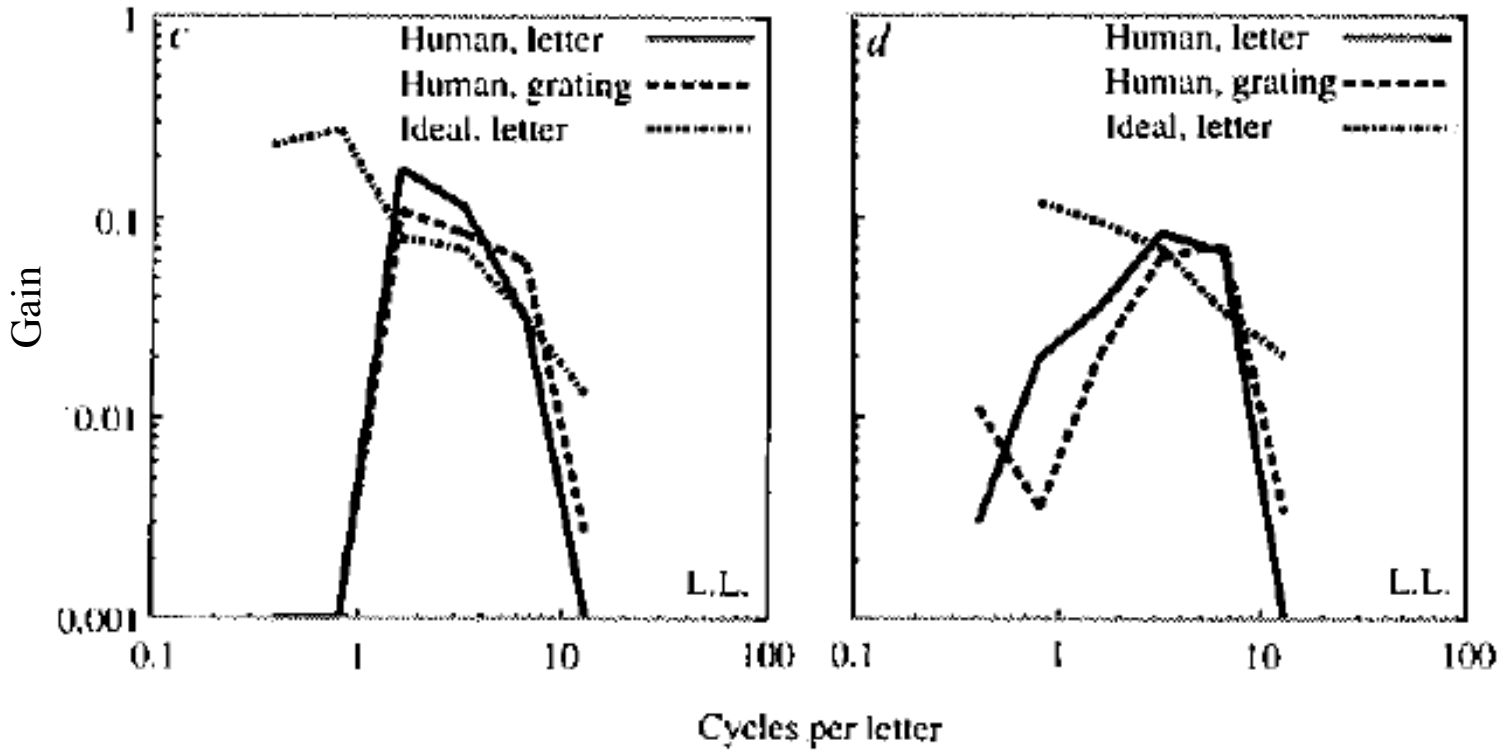
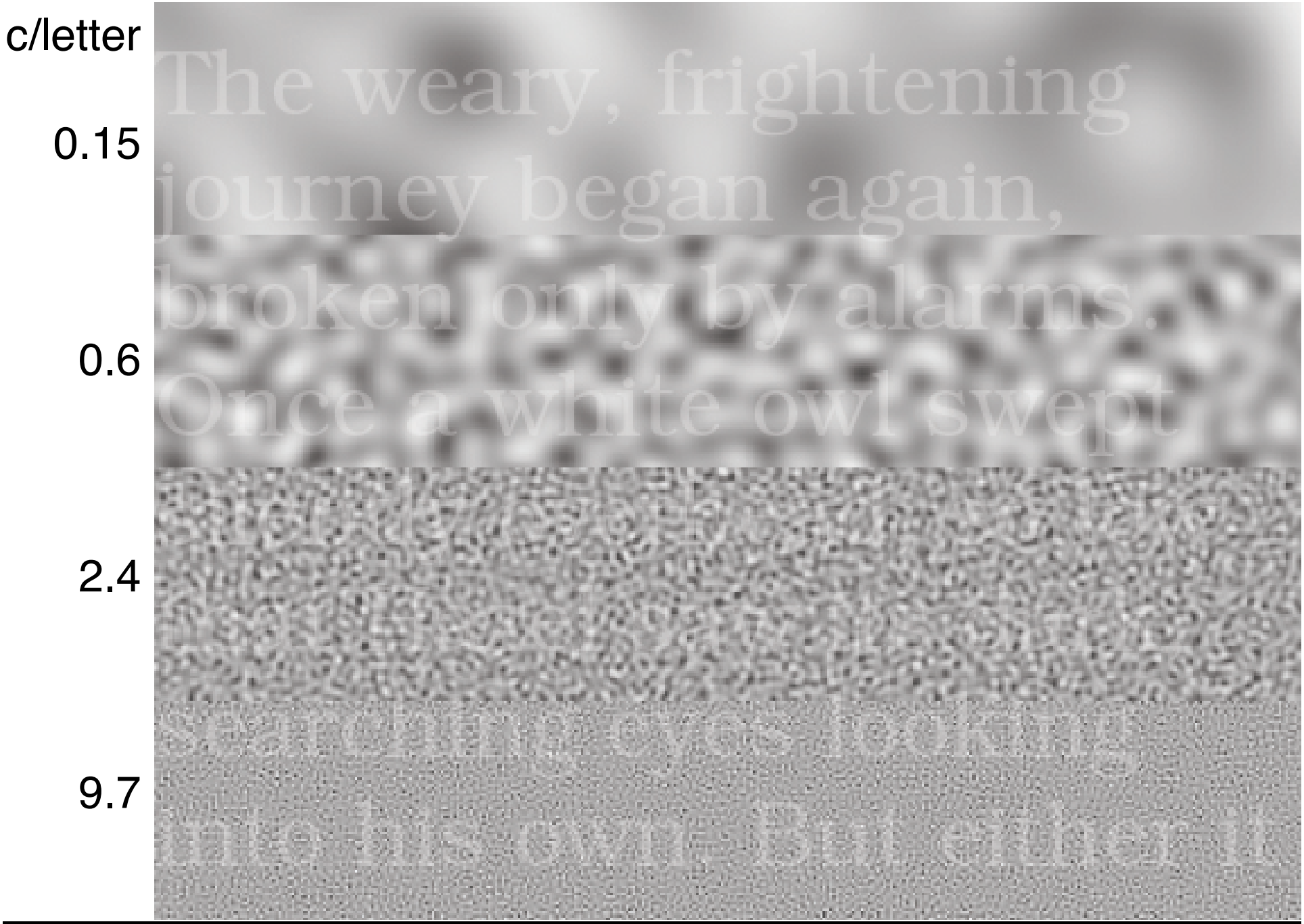


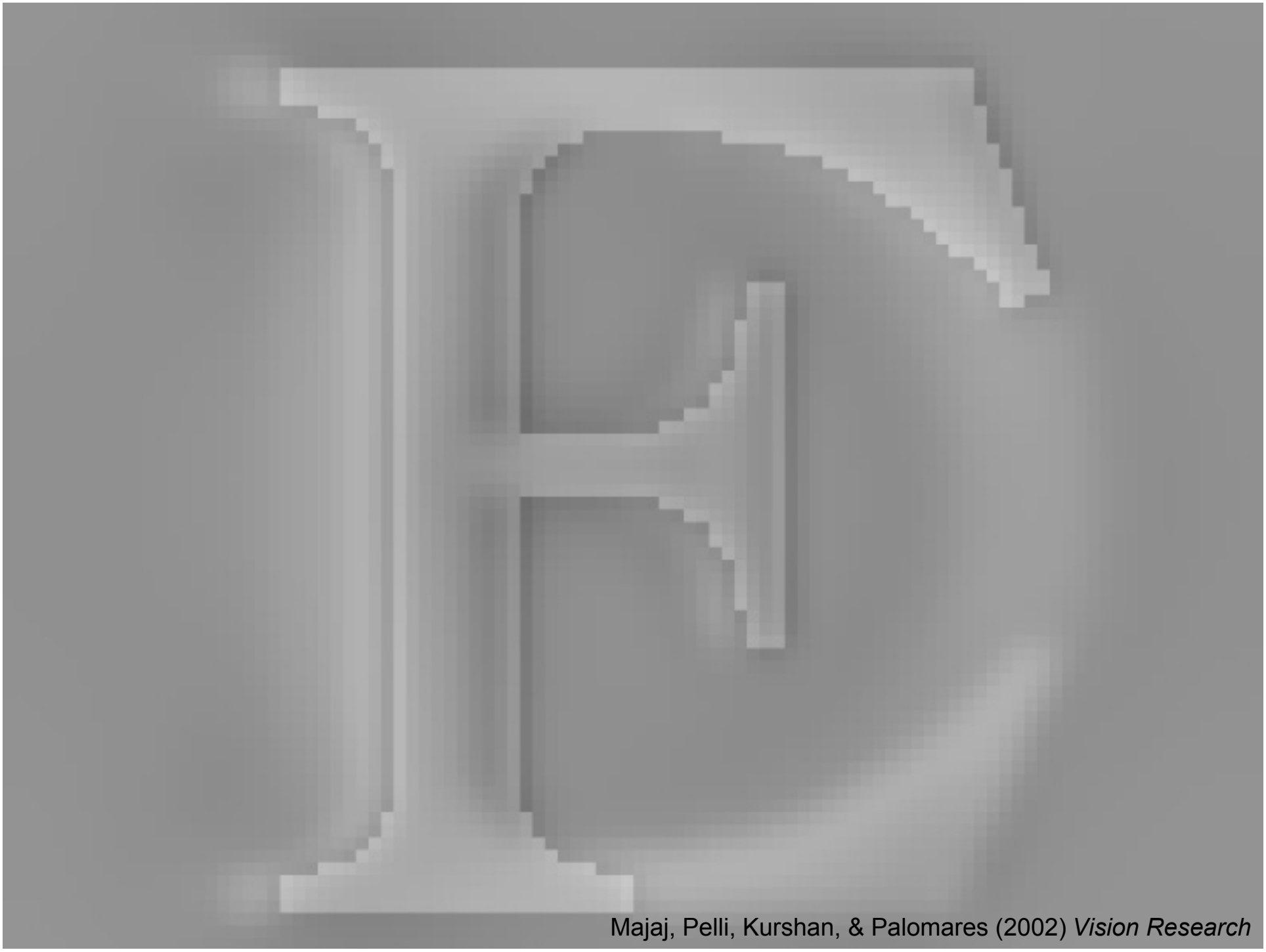
Solomon & Pelli (1994) *Nature*



Solomon & Pelli (1994) *Nature*



Majaj, Liang, Martelli, Berger & Pelli (2003) Vision Sciences Society



Majaj, Pelli, Kurshan, & Palomares (2002) *Vision Research*

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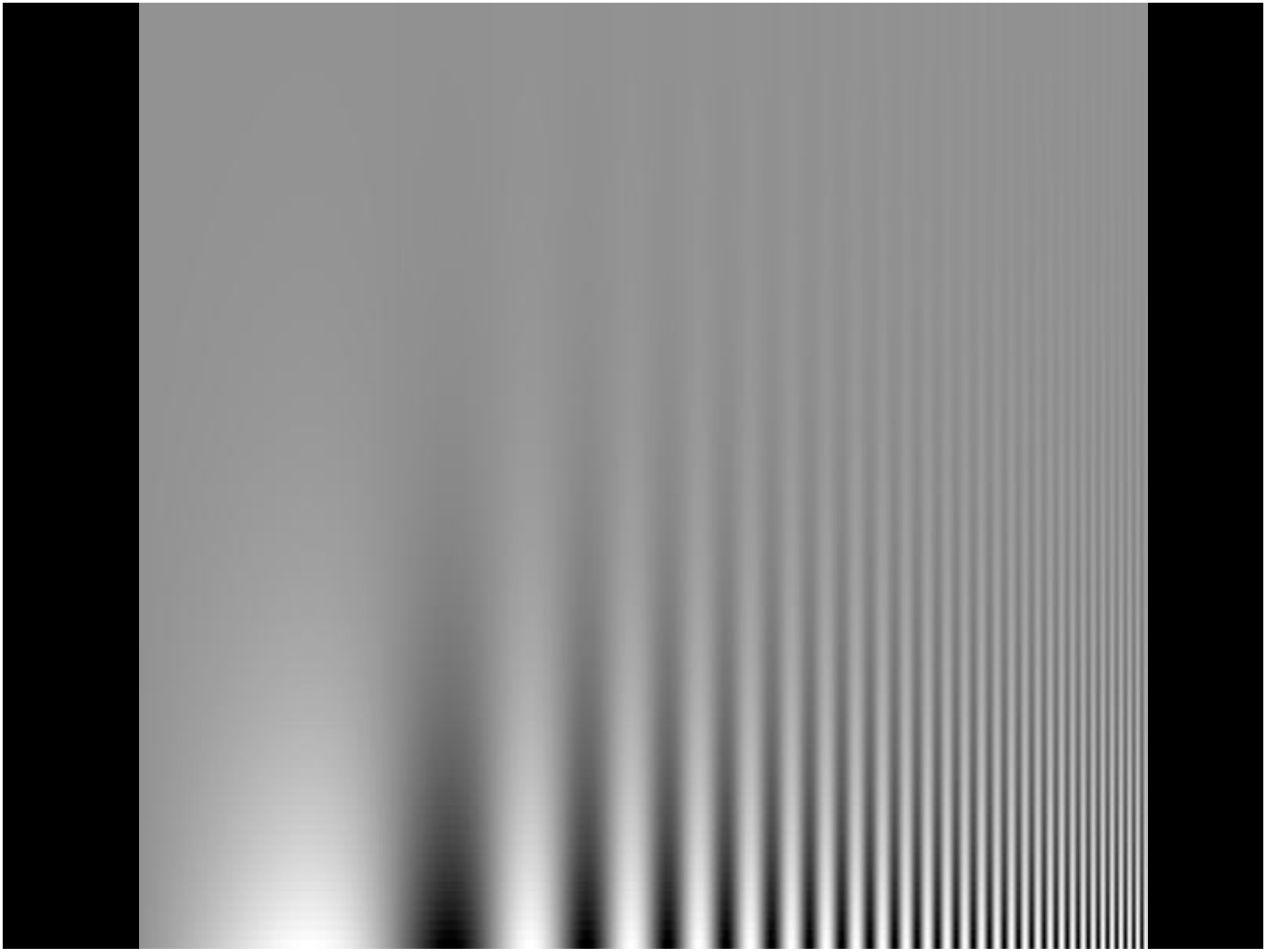
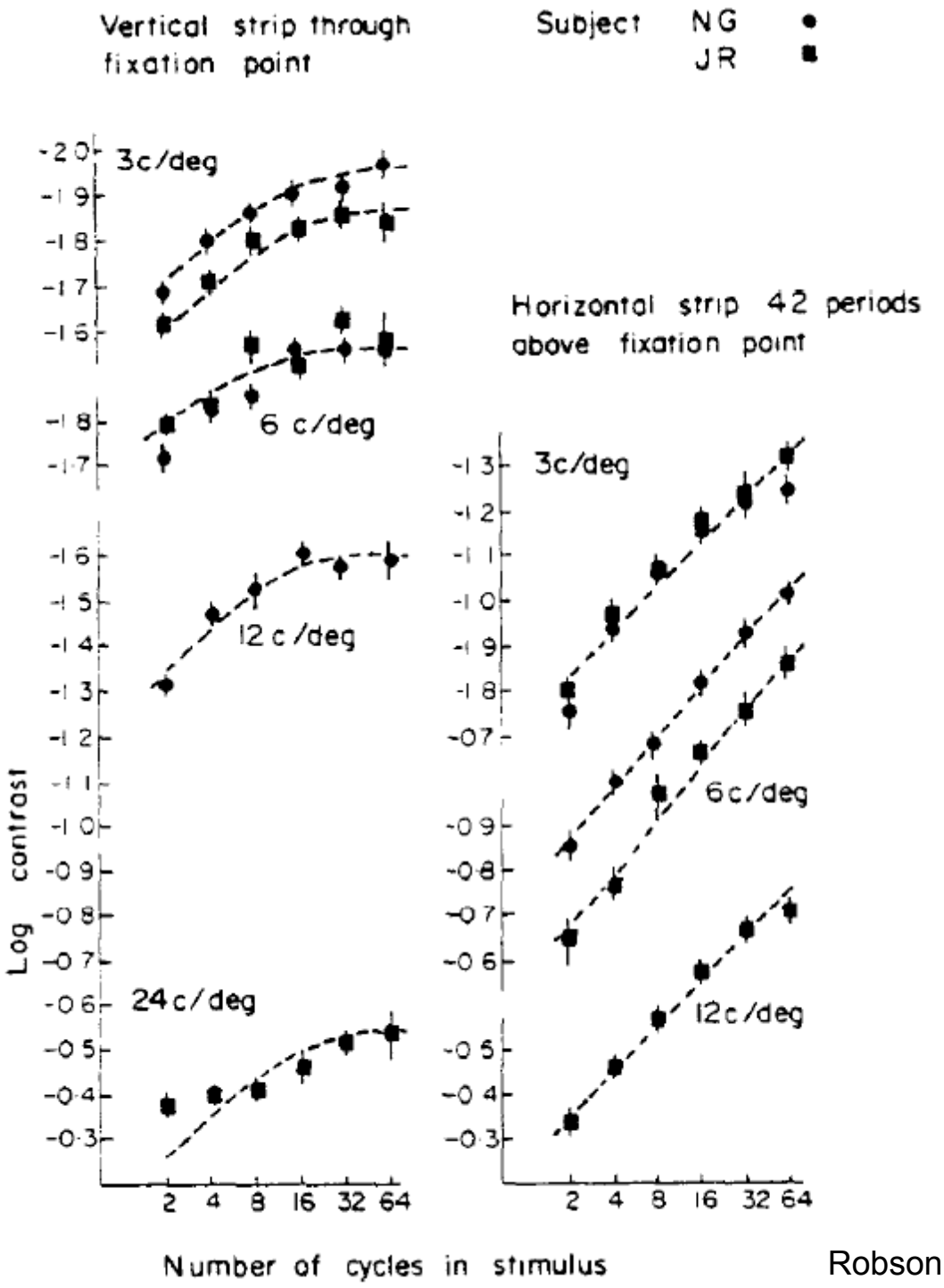
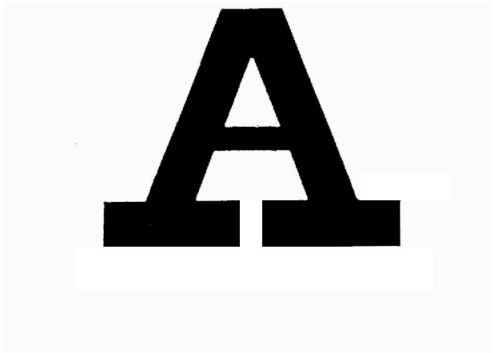




Robson & Graham (1981) *Vision Research*



C E

G L N

P R T 5

V Z B D 4

F H K O S 3

U Y A C E G L 2

English (Bookman) a b c d e f g h i j k l m n o p q r s t u v w x y z

English (uppercase Bookman) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

English (bold Bookman) **a b c d e f g h i j k l m n o p q r s t u v w x y z**

English (Courier) a b c d e f g h i j k l m n o p q r s t u v w x y z

English (Helvetica) a b c d e f g h i j k l m n o p q r s t u v w x y z

English (Künstler) *A B C D E F G H I J K L M N O P Q R S T U … Z*

Sloan C D H K N O R S V Z

Arabic x , i K L G : R T Y U 3 4 Q W A S . v 5 6 O P { E J F h

Armenian ա բ գ դ ե զ է ը թ ժ ի լ խ ծ կ հ ձ ղ ճ մ յ ն շ ո չ պ ջ ռ ս վ տ ր ց փ ք

Chinese 你 太 先 謝 再 白 好 見 不 國 會 請 人 是 說 問 本 多 共 幾 兩 毛 那 少 文 字

Devanagari अ ब च द ए फ ग ह इ ज क ल म न झ प थ र स त ऋ व ष श य ख

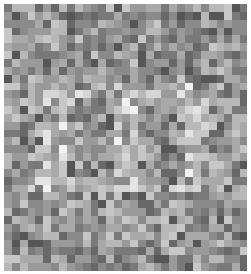
Hebrew א ב ג ד ה ו ז ח ט י כ ל מ נ ס ע פ צ ק ר ש ת

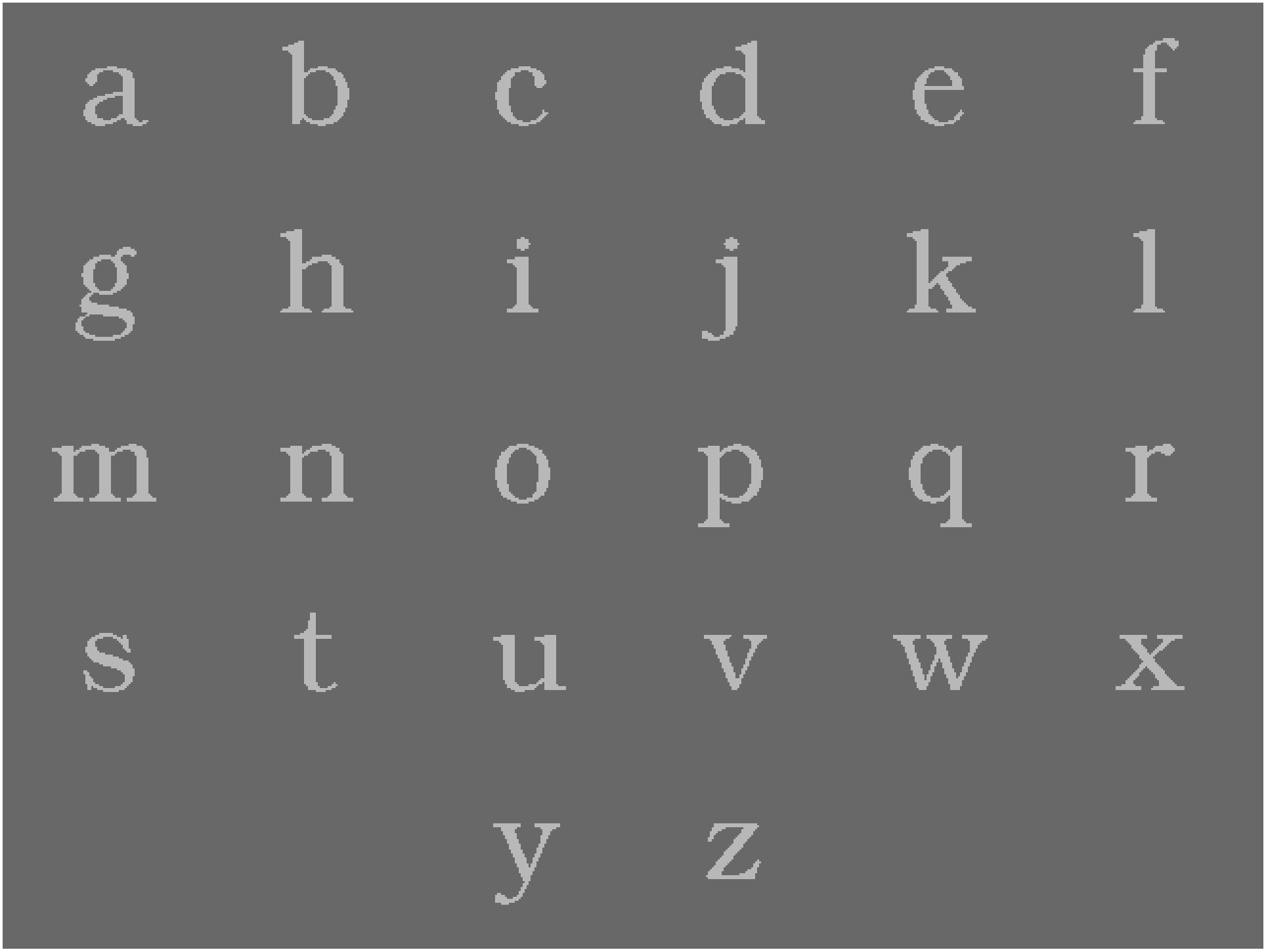
2! 3 Checkers

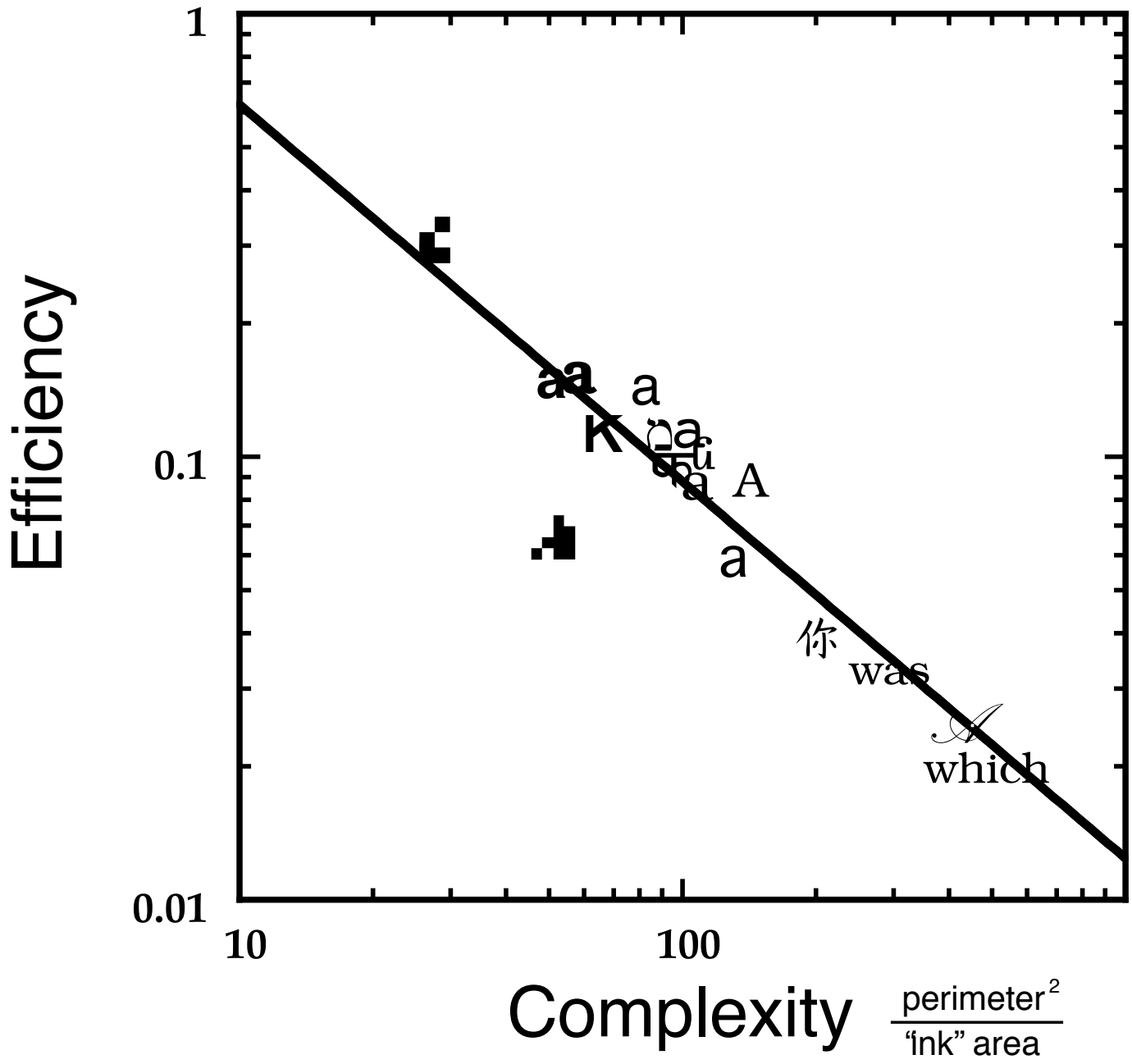
4! 4 Checkers

3-letter words all and any are but can for had has her him his its … you

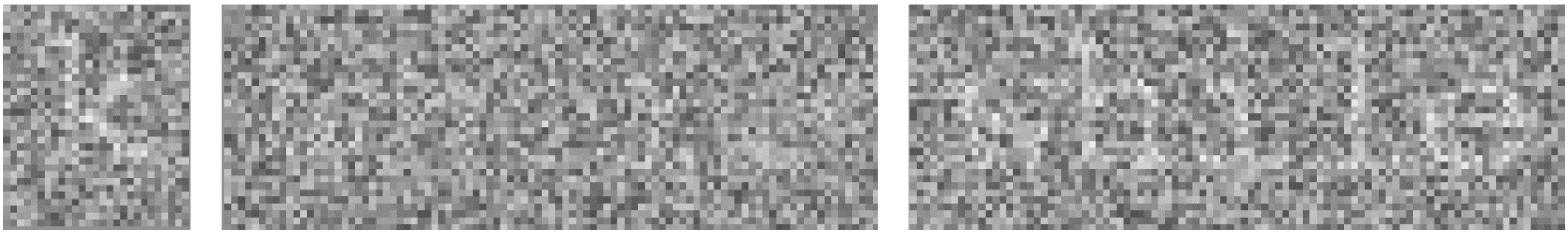
5-letter words about after being could first great house might never … years



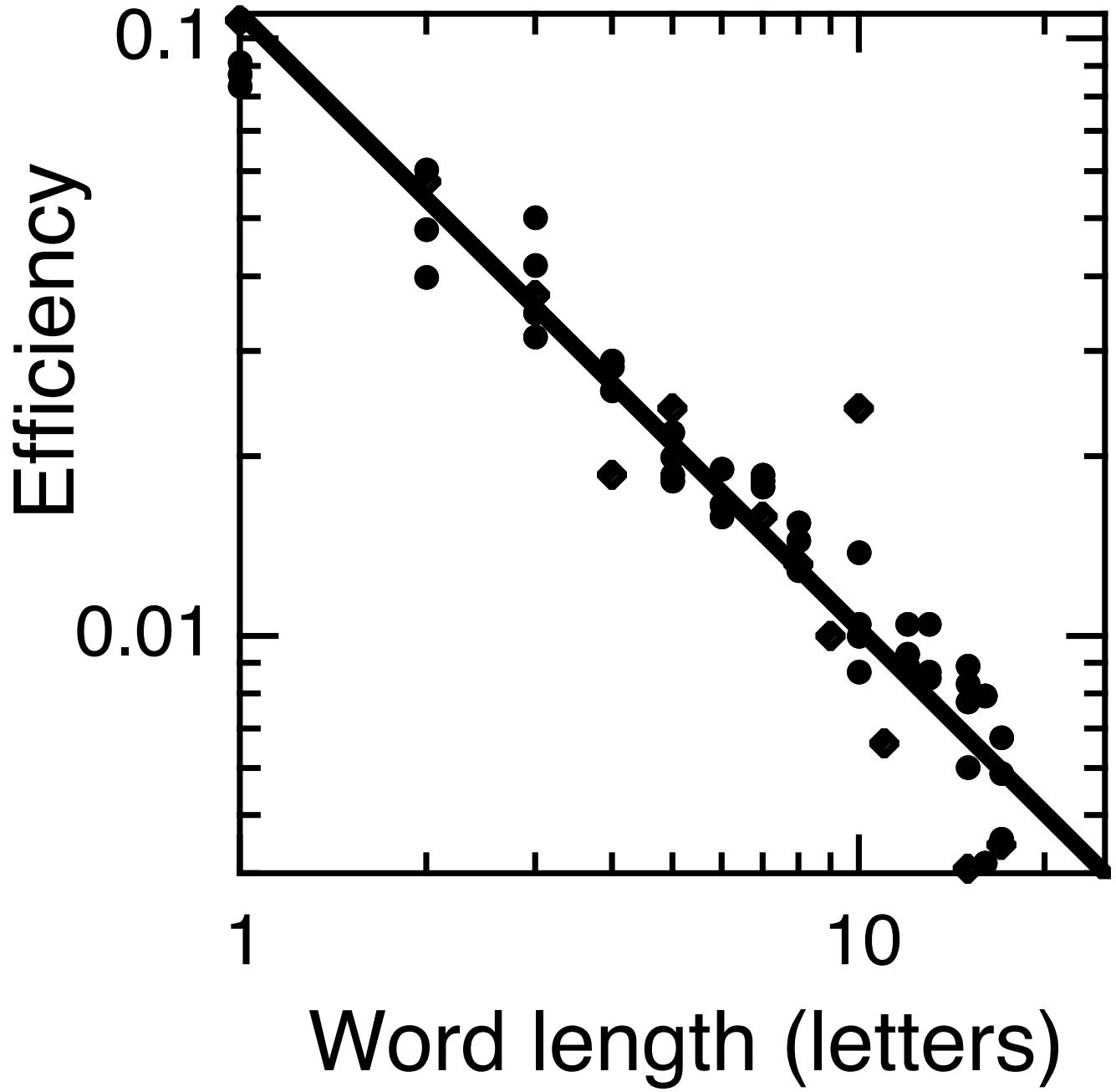

a b c d e f
g h i j k l
m n o p q r
s t u v w x
y z



Pelli, Burns, Farell, & Moore (2005) *Vision Research*



Pelli, Farell, & Moore (2003) *Nature*



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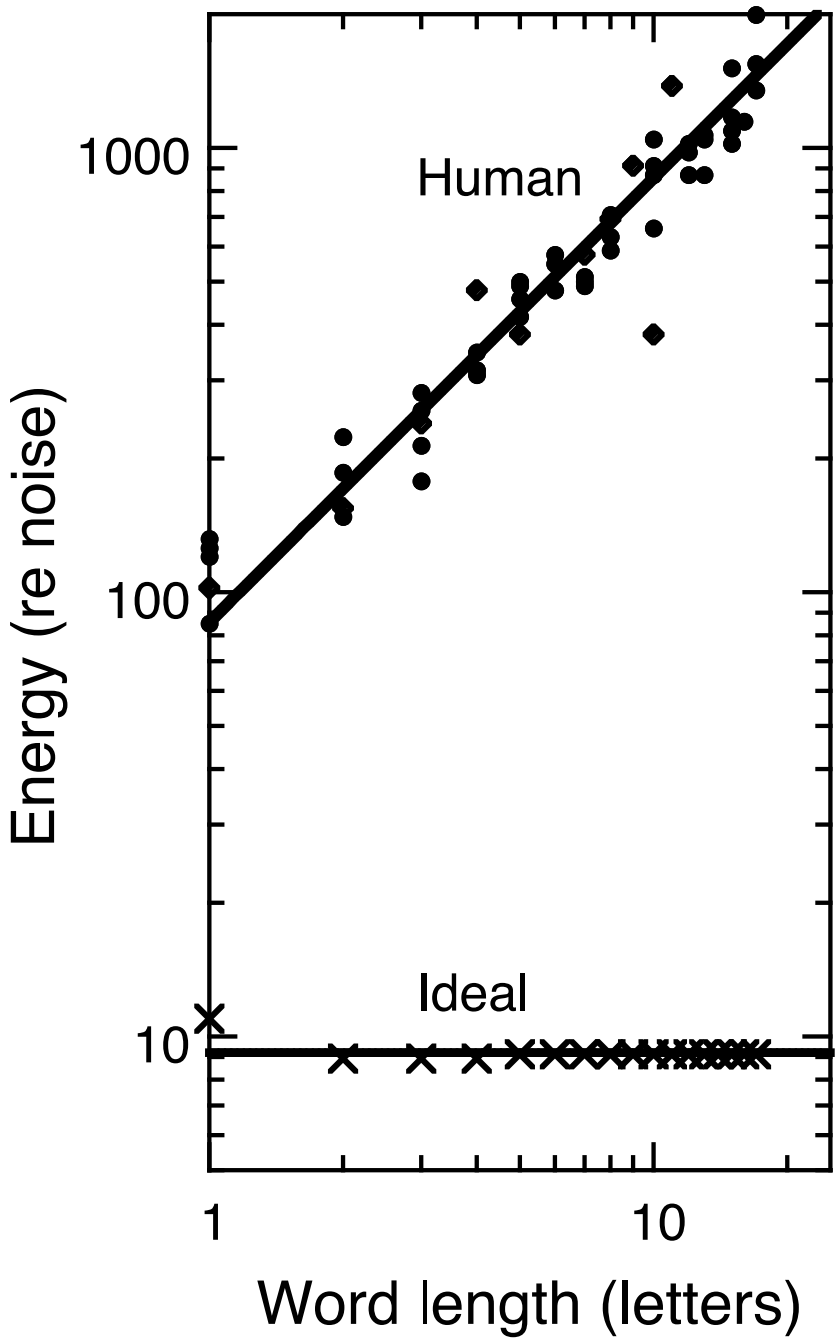

Pelli, Farell, & Moore (2003) *Nature*

Of course you can read letter by letter

but can you read word by word?

Pelli, Farell, & Moore (2003) *Nature*

h other
u great
y those house
o state years
z three still
b could under
v right there
p never after
s since world

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