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1** 2 3 4 5

1. / 20892 2. 100871 3. 100871 4. 100871 5. 100871

V1
B849 A 1006 – 6020 2017 – 02 – 0099 – 11

1

The Princip P r

stimulus-driven mechanism

bottom-up attention

transient attention

exogenous attention

frontal eye field FEF

dorsomedial prefrontal cortex DMPFC

later prefrontal cortex LPFC

anterior cingulate cortex ACC

posterior parietal cortex PPC

intraparietal sulcus IPS

fronto-parietal attentional network

default network

Baluch & Itti 2011; Botvinick et al. 2001; Bush et al. 2000; Kastner & Ungereider 2000; Noudoost et al. 2010; Serences & Yantis 2006; Swisher et al. 2007; Zhang et al. 2016

Jonides 1981; Nakayama & Mackeben 1989

William James

2

2.1

salient

saliency

Niebur & Koch 1998; Olshausen et al. 1993; Tsotsos et al. 1995

Koch Ullman 1985

Treisman

master map Treisman 1988

Itti 1998

1

9

centre-surround differencing

c

c − 1

c − 1

6

12

Gabor

24

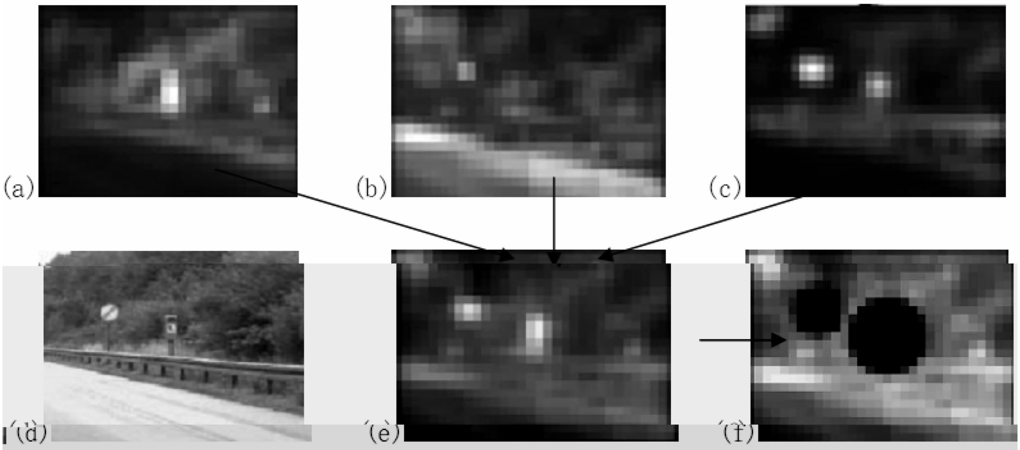
42

winner-take-all

inhibition of return

Klein 2000

Itti 1998, Treisman feature integrated theory Treisman & Gelade 1980, 1



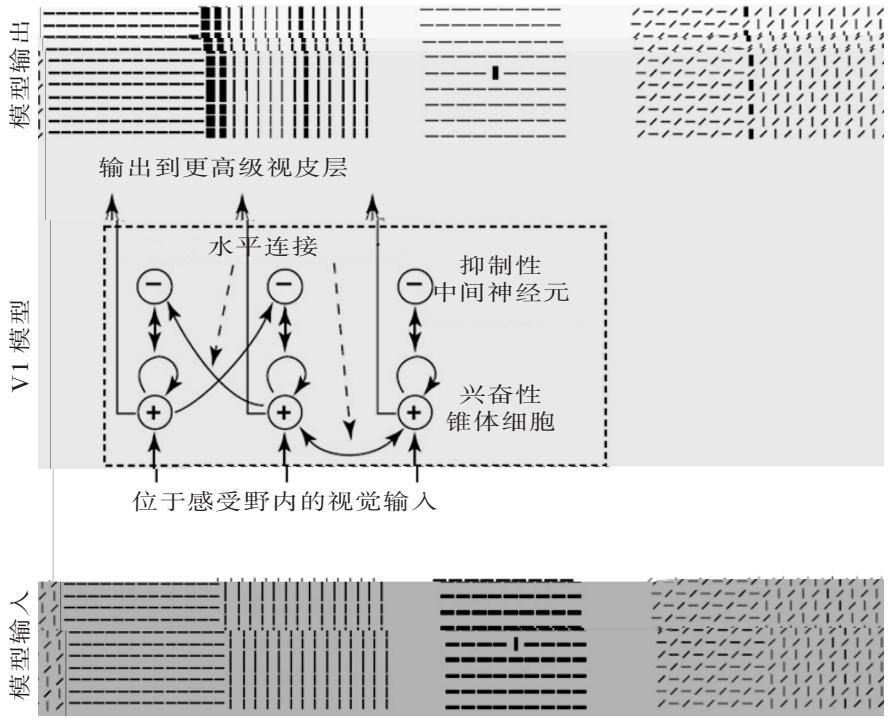
1

1 a, b, c, d, e, f, Itti et al. 1998

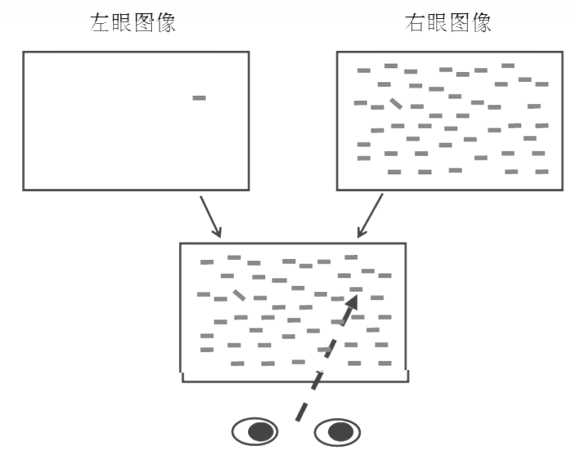
Itti 1998, Itti & Koch 2001; Koch & Ullman 1985; Wolfe 1994, V1, superior colliculus (Fecteau & Munoz 2006; Kustov & Robinson 1996) pulvinar (Shipp 2004) parietal cortex (Bisley & Goldberg 2010; Bogler et al. 2011; Geng & Mangun 2009; Gottlieb et al. 1998; Serences et al. 2005) V4 (Mazer & Gallant 2003) FEF (Serences & Yantis 2007; Thompson & Bichot 2005) PFC (Katsuki & Constantinidis 2012)

2.2 V1

V1 Allman et al. 1985; Gilbert & Wiesel 1983; Rockland & Lund 1983, Li 1999, 2002, V1 Shipp 2004, V1 V1 pop-out, V1 2,


模型输出
输出到更高级视皮层
V1 模型
水平连接
抑制性
中间神经元
兴奋性
锥体细胞
位于感受野内的视觉输入
模型输入

2



3

Zhaoping 2008

2.3

Itti et al. 1998

Li 1999 2002

Bisley et al.

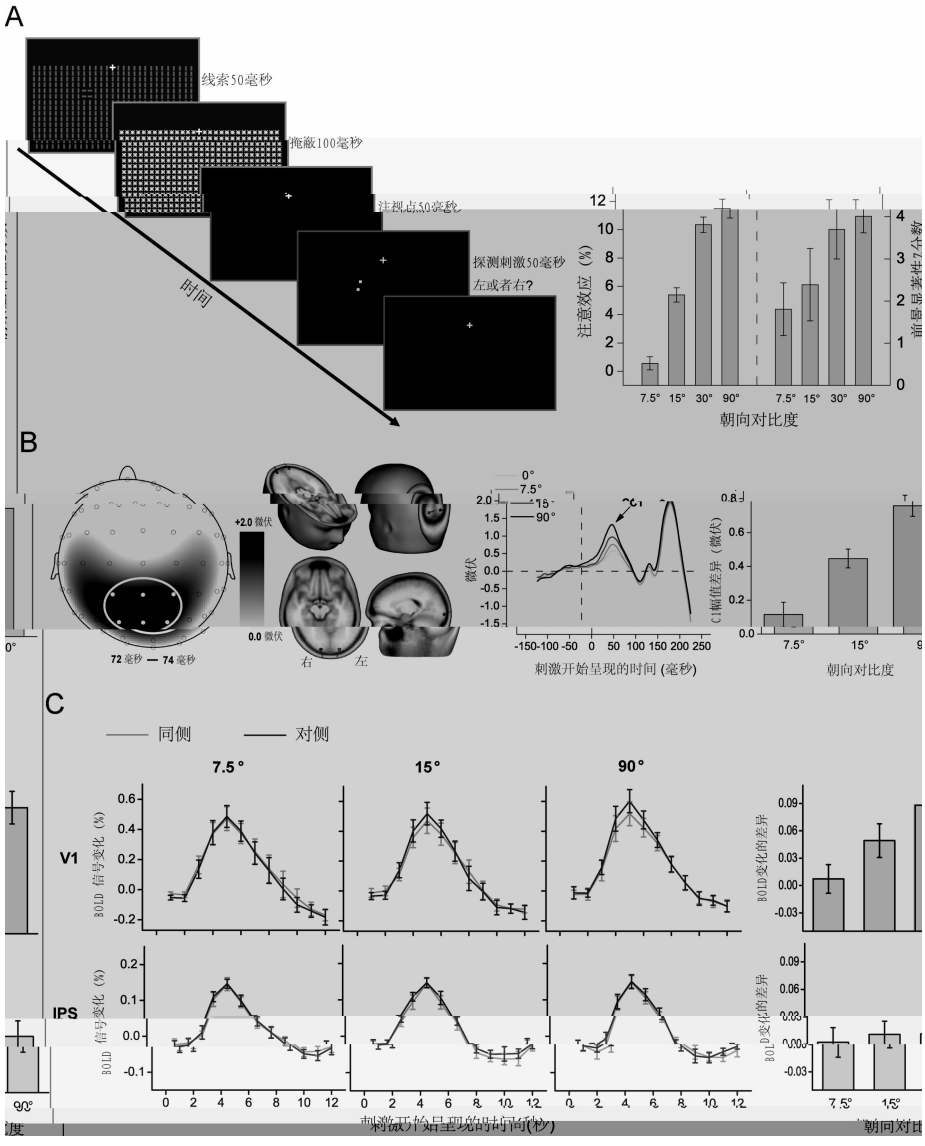
2010

V4

G

Schiller & Lee 1991 V4

Burrows & Moore


A
线索50毫秒
掩蔽100毫秒
注视点50毫秒
探测刺激50毫秒
左或者右?
时间
注意效应 (%)
朝向对比度
B
+2.0 微伏
0.0 微伏
72 毫秒 — 74 毫秒
右
左
微伏
刺激开始呈现的时间 (毫秒)
C1幅值差异 (微伏)
朝向对比度
C
同侧
对侧
7.5°
15°
90°
V1
IPS
BOLD 信号变化 (%)
BOLD变化的差异
刺激开始呈现的时间(秒)

4 V1

3

vernier task V1

bisection task

5 A pop-out

Asplund 2010

inferior frontal junction IFJ

FEF IPS IFJ TPJ VFC

Li Gilbert 2002 Li 2008 McManus 2011

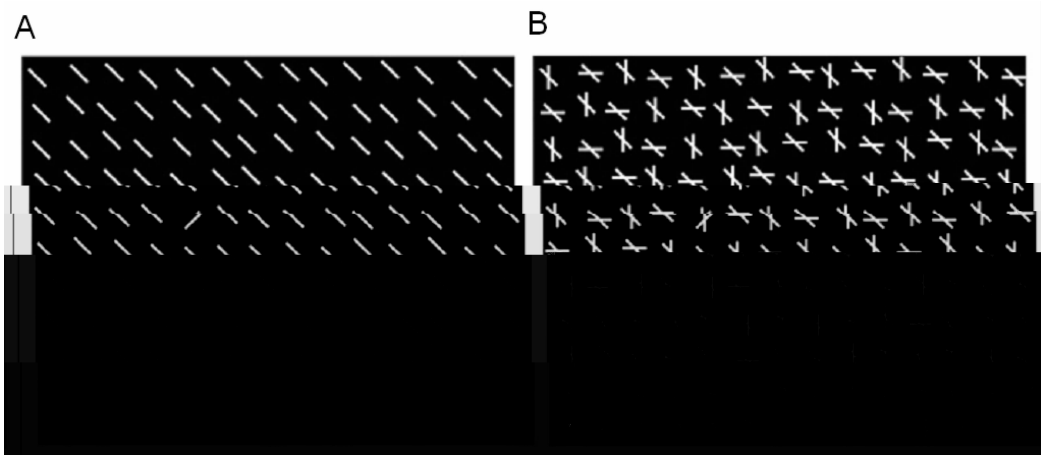
Freeman V1 2003

Li 2004 V1

Krauzlis et al. 2013 Michael & Buron 2005 Saalmann & Kastner 2011 Fecteau et al. 2006 Kustov et al. 1996 Shipp 2004 Snow et al. 2009 Zénon Krauzlis 2012

Zhao ping Guyader 2007

Chen et al. 2016 Li 1999 2002 Zhang et al. 2012 VFC Corbetta et al. 2002 TPJ IPS FEF



5

Zhaoping & Guyader 2007,

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Neural Mechanisms of Bottom-up Attention

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Abstract

The stimulus-driven contribution to the allocation of attention is bottom-up attention. Investigating its neural mechanisms leads to a better understanding of how the brain creates consciousness. Although bottom-up selection is typically quick and potent, there are controversies concerning the brain regions involved. Two models with their respective evidence about bottom-up attention over the past decades were reviewed: the saliency-based attention and primary visual cortex (V1), saliency map models. Issues for future studies were further discussed.

Key words: attention, bottom-up attention, saliency map, brain imaging, primary visual cortex (V1)