Implementing Early Odor Training

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Professor Working Dog Sciences & Sports Medicine

Director, Penn Vet Working Dog Center

Research Topic

Working Dogs: Form and Function, Volume II

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About this Research Topic

Following on from the success of the Research Topic "Working Dogs: Form and Function", we are pleased to launch Volume II. This will provide a single point of reference for the current state of the art on the science of working dog performance. Dogs assist humans in a multitude of roles including as detectors, guides, guardians, stock herders, assistants and professional canine athletes. The role of working dogs touches on a mutual need of human and dogs for companionship, assistance and security, and there is increasing demand for evidence-based research on how to enhance the performance and success of human and working dog partnerships. The ability of a dog to complete tasks depends on their physical and behavioral traits, their ability to exert themselves at various demanding tasks requires both physical and behavioral stamina, agility, and resilience.

This Research Topic encourages the submission of manuscripts that explore themes such as (but not limited to):
i) The influence and interactions of genetics, health, environment and training are areas that can provide new insight to improve

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Working Dogs: Form and Function

Cynthia M Otto · Erik Wilsson and Mia Cobb

approach to the science of working dog performance. The ability of a dog to complete tasks depends on

Submission closed

116,050 total views **9,897** downloads

Canine Olfactory Detection

Cynthia M Otto and Claire Marie Guest

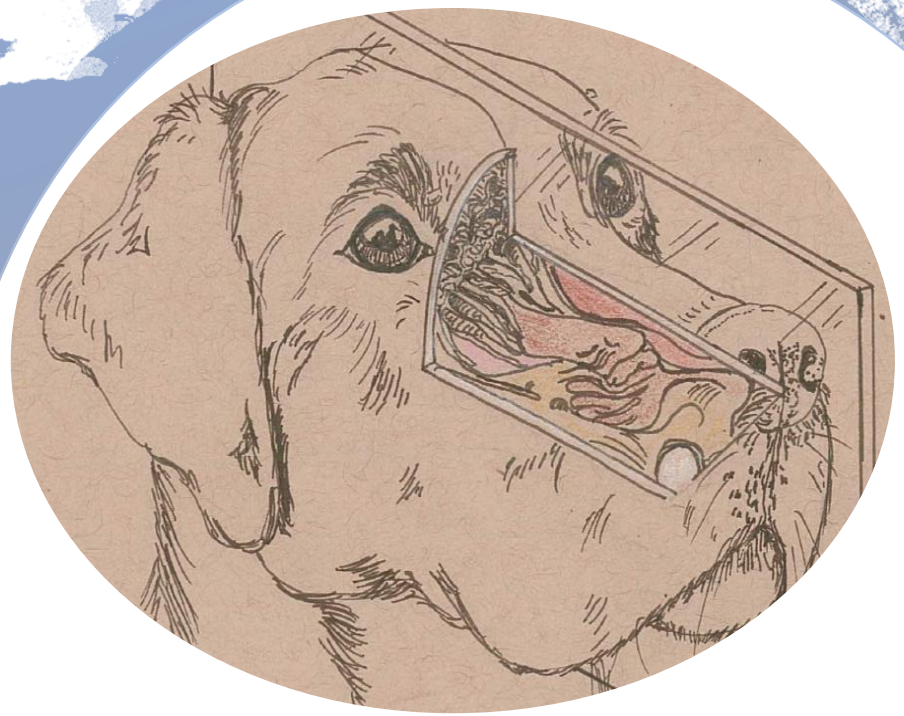
ability of the dog far exceeds that of humans. In order to better understand how dogs interact with their

Submission closed

77,350 total views **3,252** downloads

Outline

- **Introduction to Penn Vet Working Dog Center**
- Canine Olfaction and Development
- Why Implement Early Odor Training?
- How to Implement Early Odor Training



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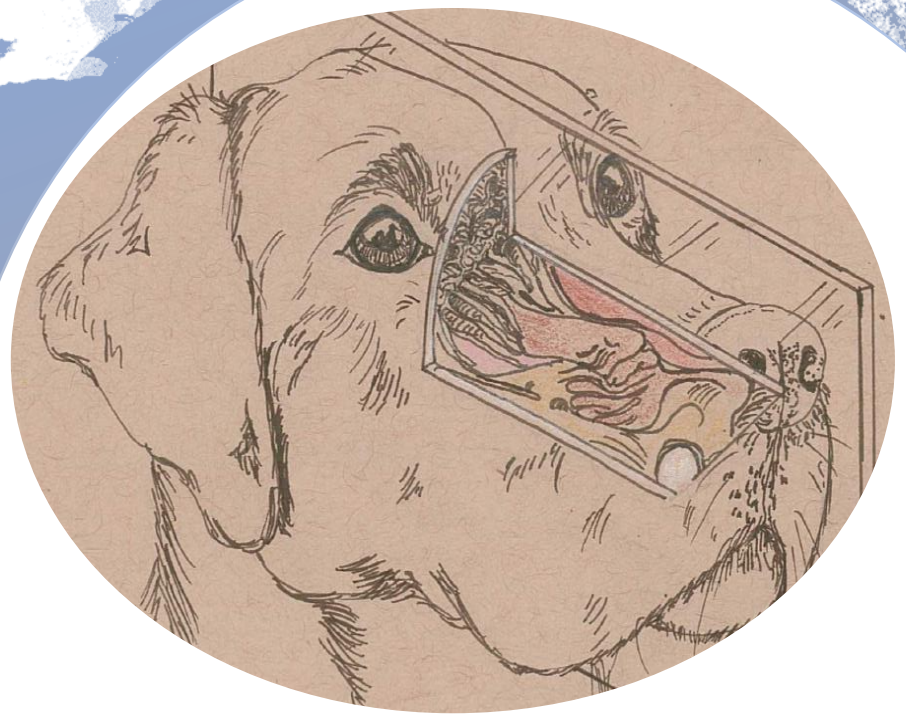
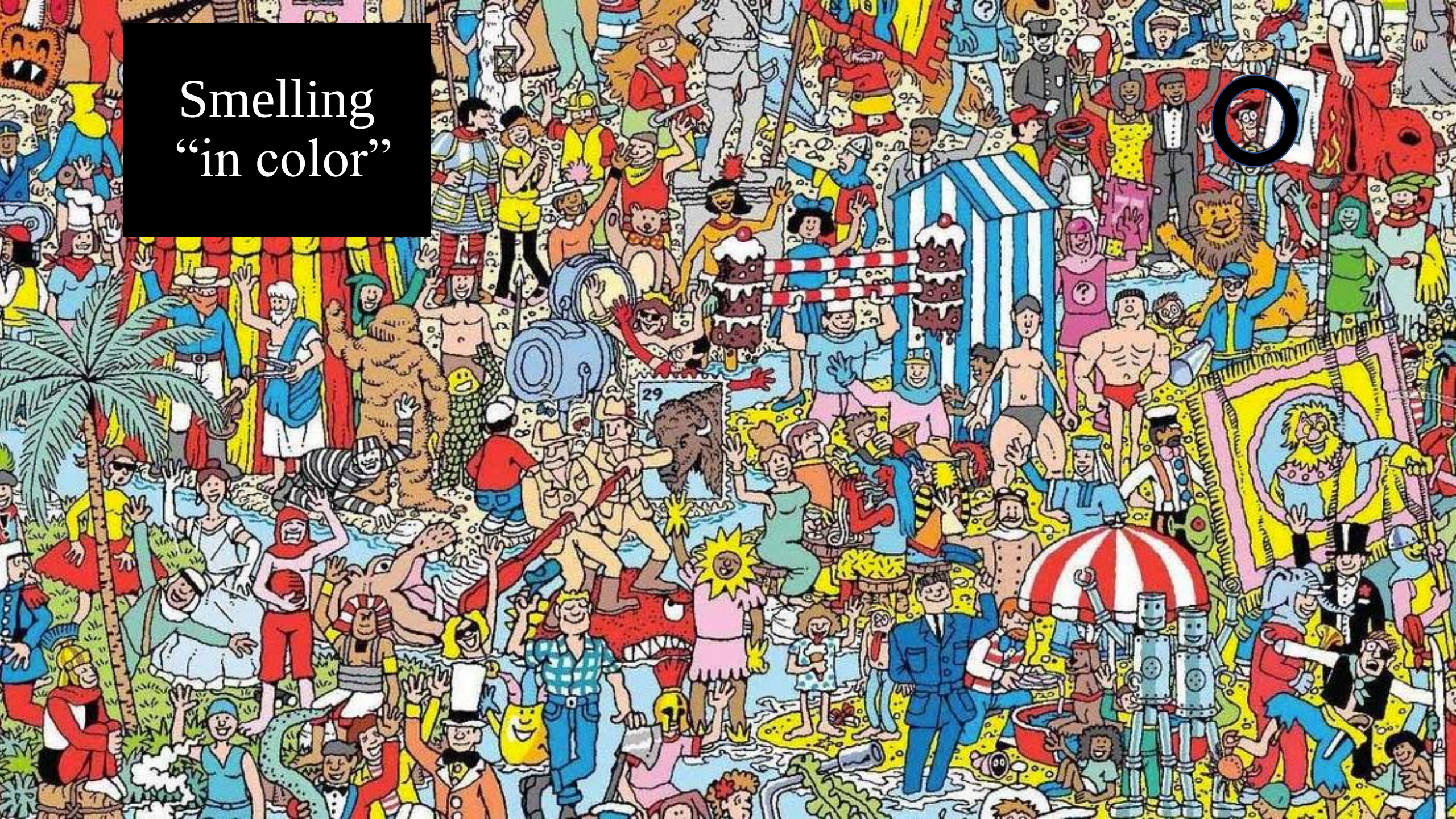
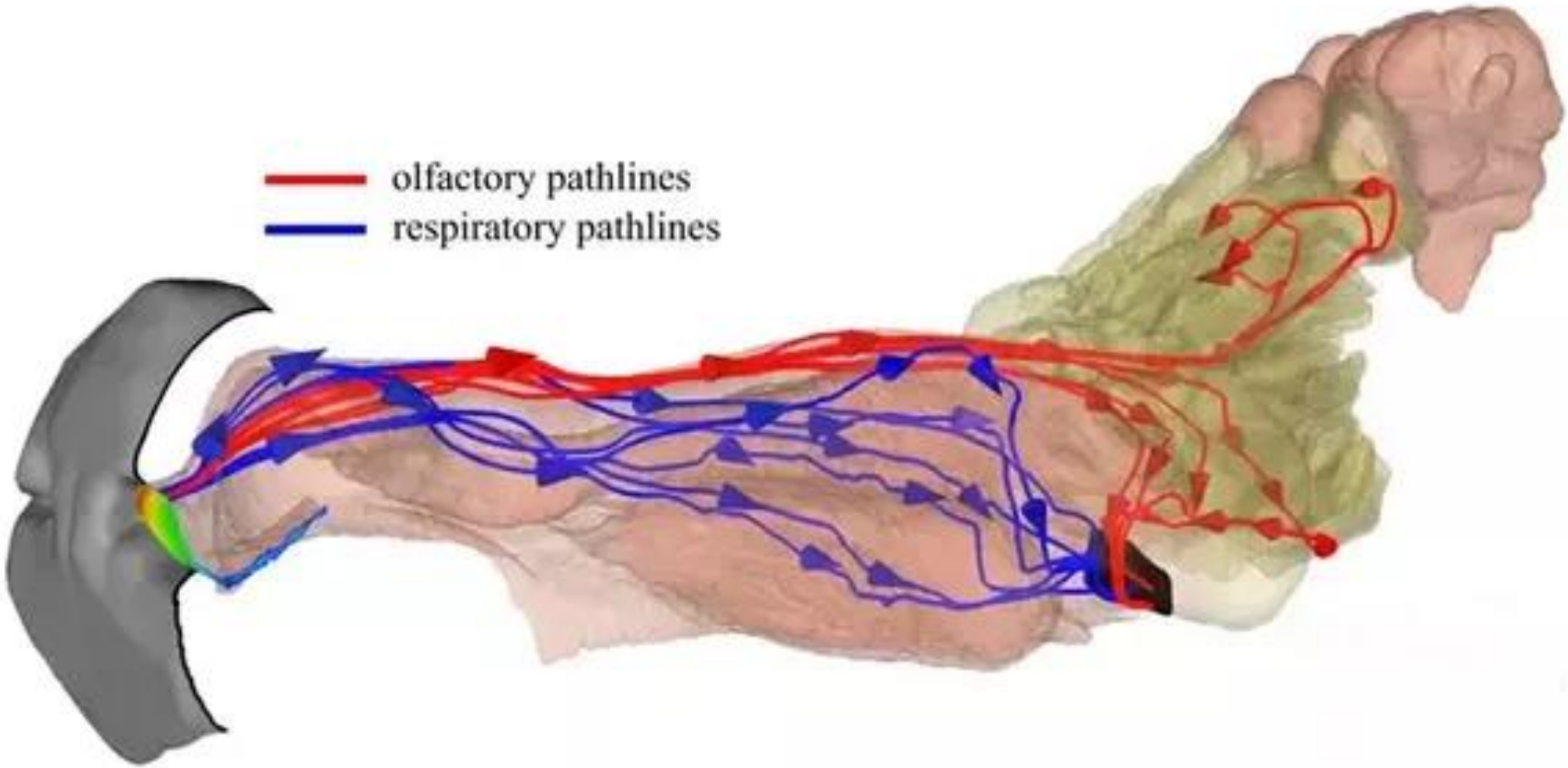



Smelling
“in color”



Lawson et al 2012 Chem Senses

sniffing

https://www.nist.gov/video/dog-nose-visualization-1

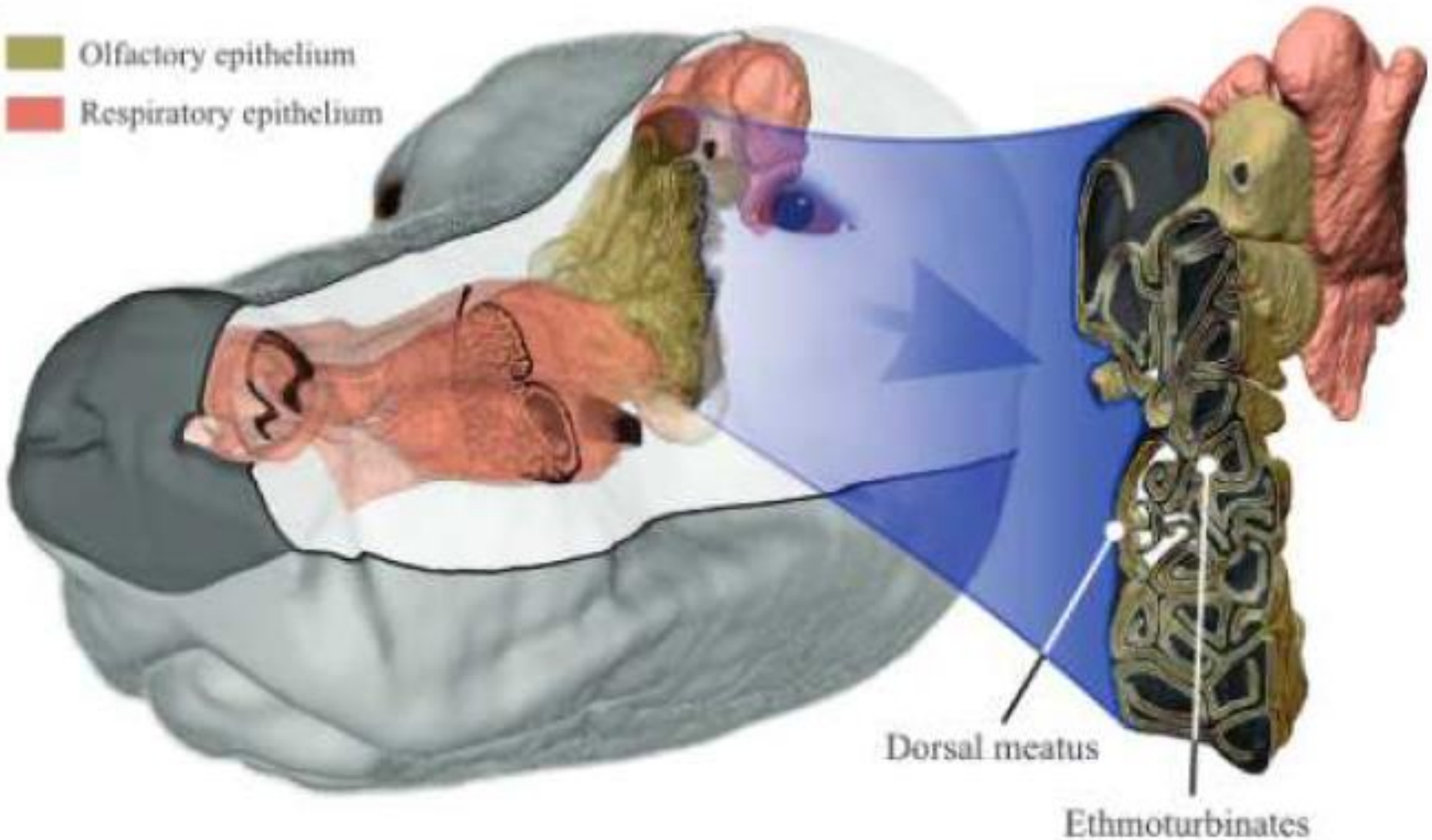


Figure 1 The computer model of the canine nasal airway.

From MRI of Labrador nasal airway – Lawson et al 2012 Chem Senses

Olfactory Epithelium

A catacomb at the back of the nasal passage houses sensory receptors.

Humans	*Dogs*
1 in² surface area	**30 in²** surface area
~6 million receptors	**~250** million receptors

cross section

Olfactory Bulb

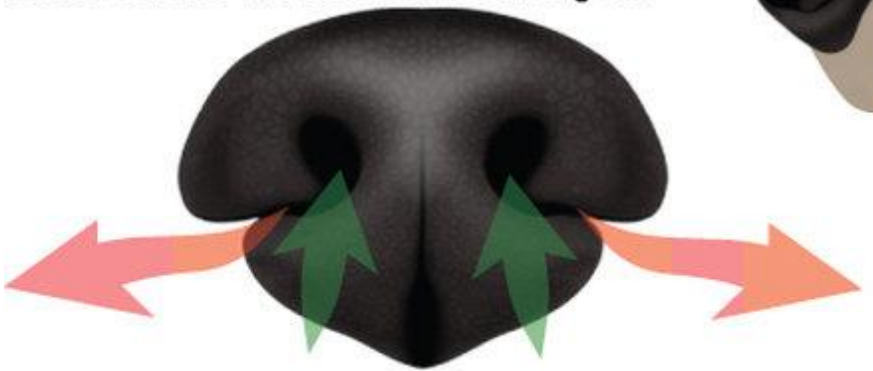
A brain region that processes signals from the olfactory epithelium. Canine olfactory bulbs are **3 times larger** than those of humans, even though their brains are **10 times smaller**.

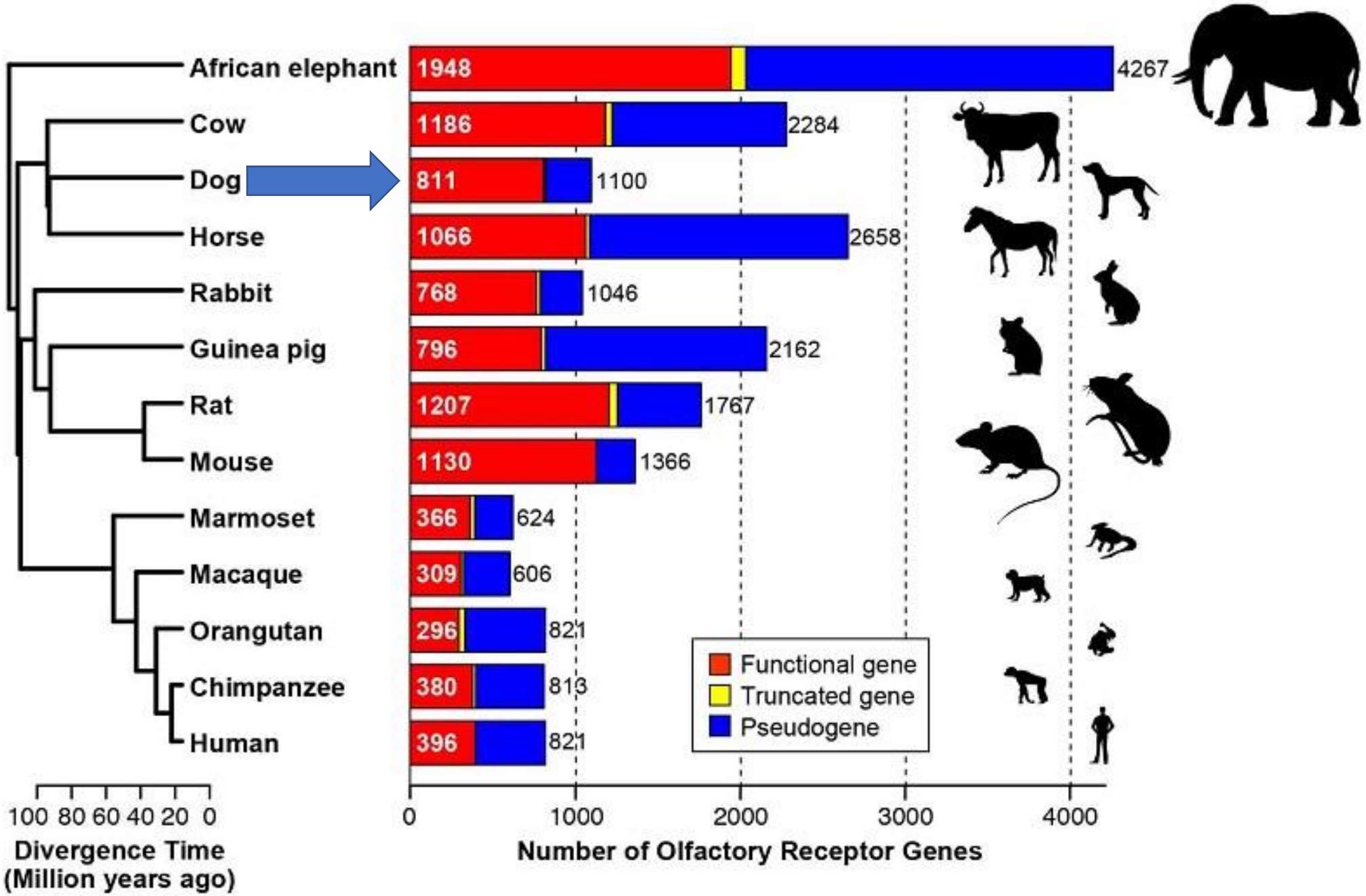
Vomeronasal Organ

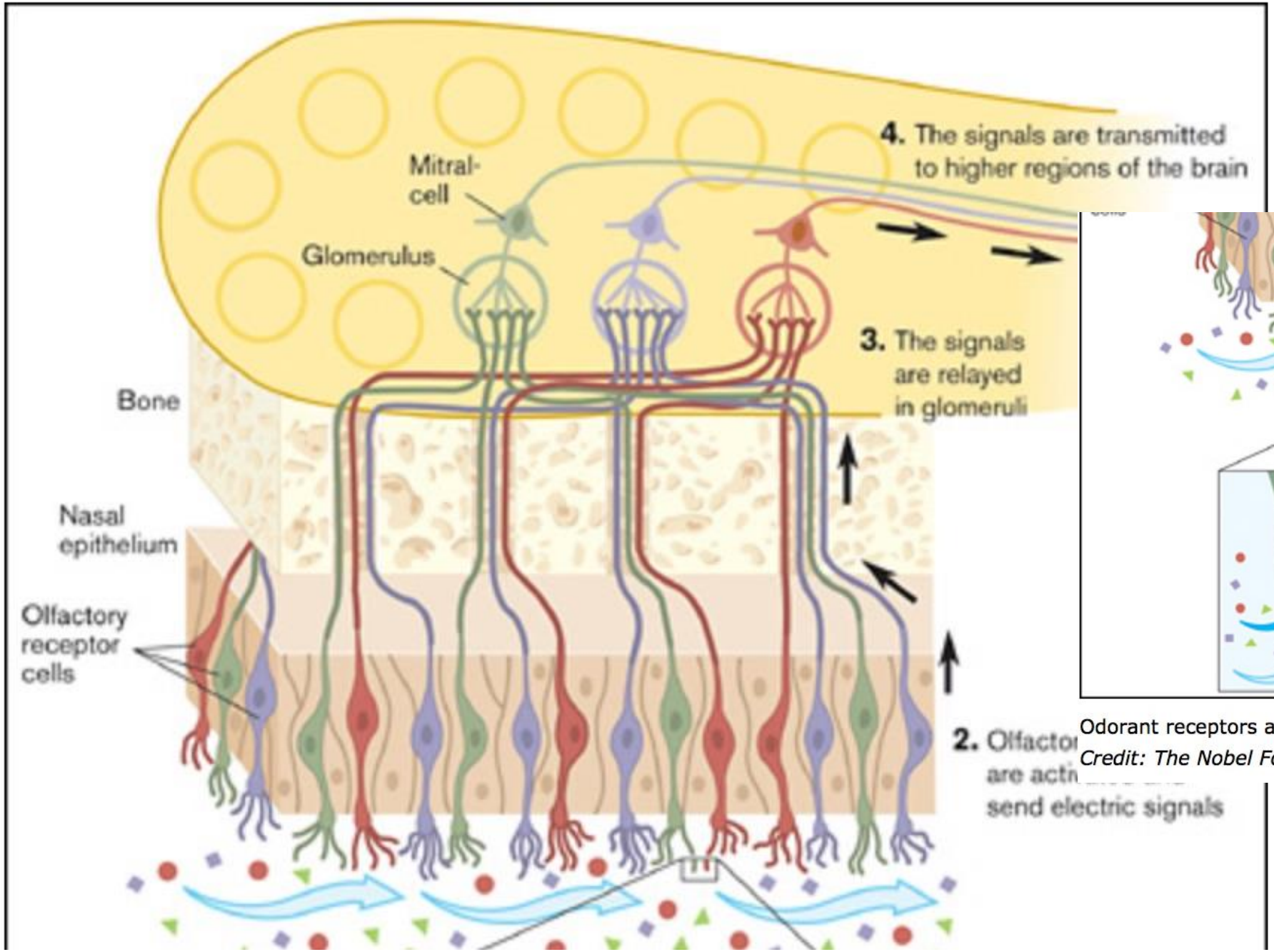
A sensory organ that detects pheremones, VOCs, other molecules picked up by a dog's wet nose.

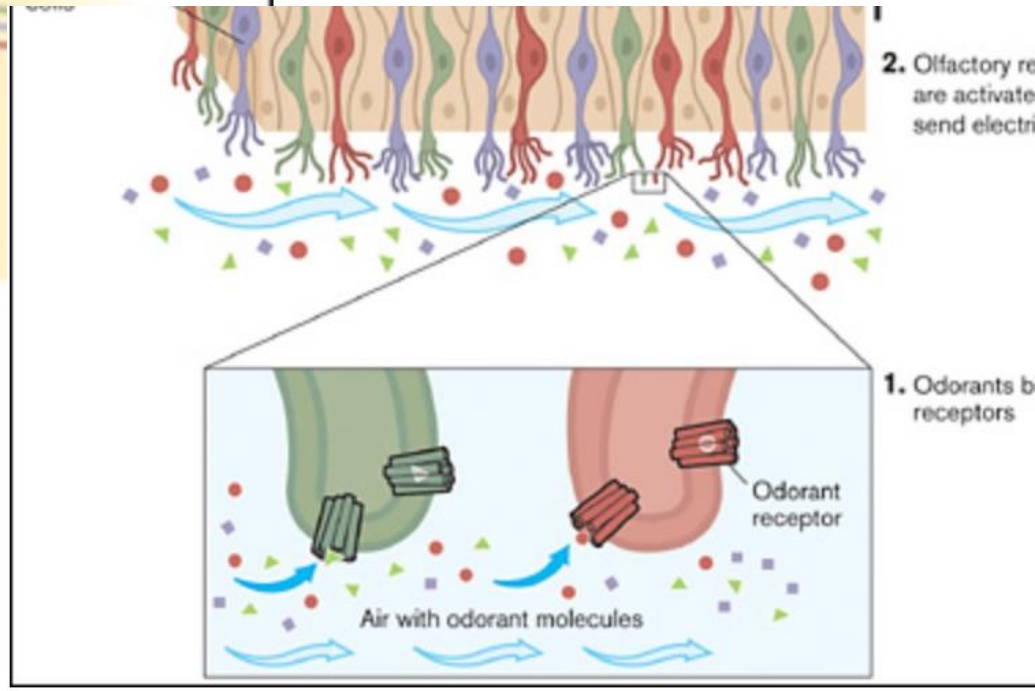
Nostrils

Air is exhaled through the side slits, so it doesn't dilute the scent of incoming air.




African elephant
Cow
Dog
Horse
Rabbit
Guinea pig
Rat
Mouse
Marmoset
Macaque
Orangutan
Chimpanzee
Human
1948
4267
1186
2284
811
1100
1066
2658
768
1046
796
2162
1207
1767
1130
1366
366
624
309
606
296
821
380
813
396
821
Functional gene
Truncated gene
Pseudogene
100 80 60 40 20 0
Divergence Time
(Million years ago)
0
1000
2000
3000
4000
Number of Olfactory Receptor Genes





Odorant receptors and the organization of the olfactory system.
Credit: The Nobel Foundation

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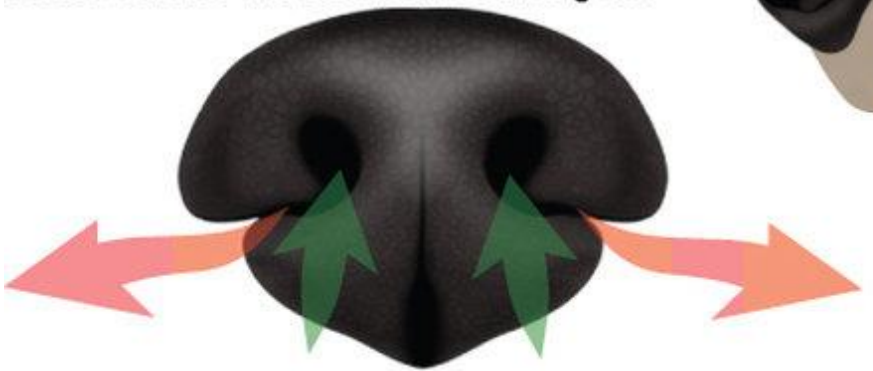


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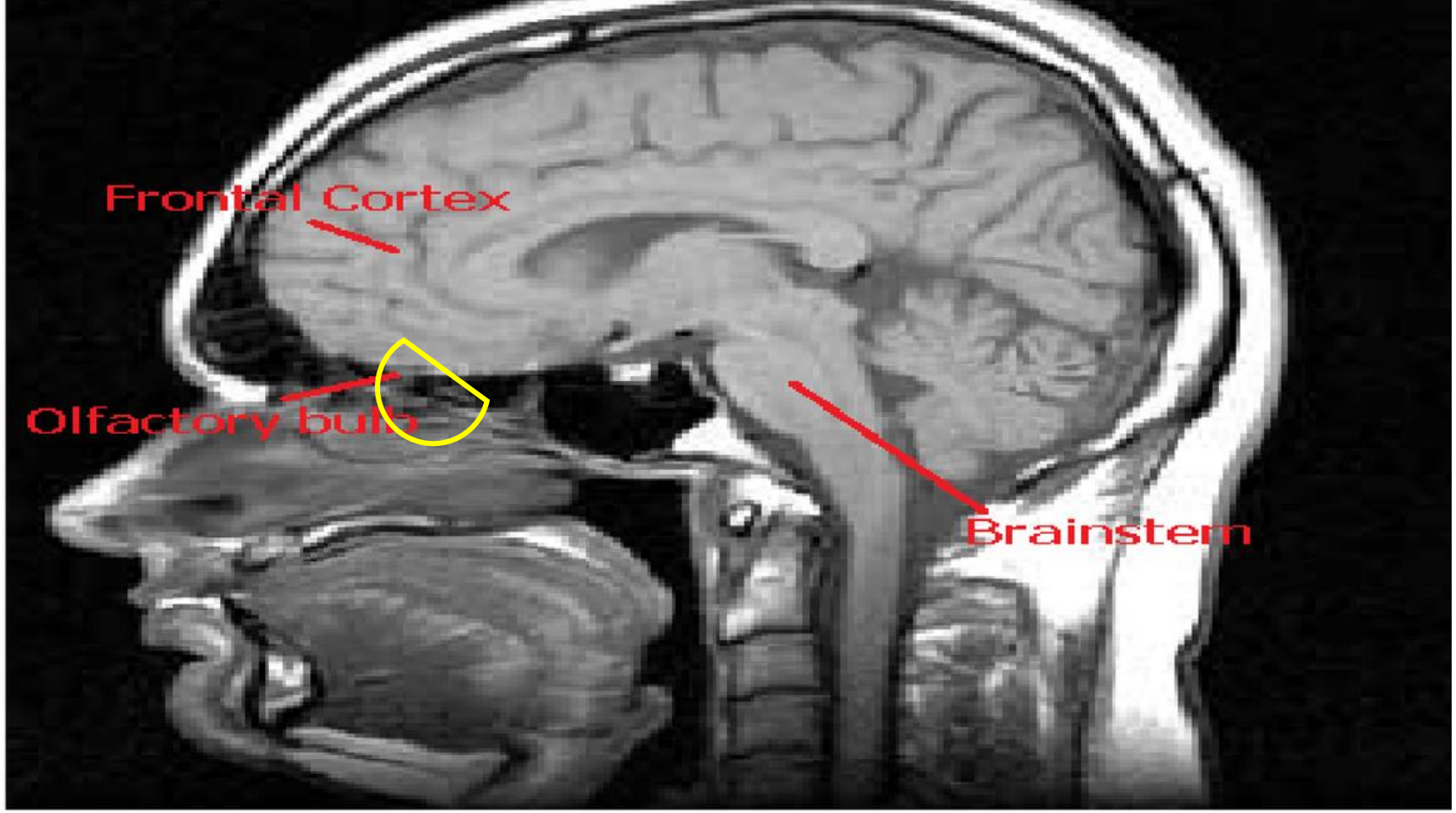

By https://en.wikipedia.org/wiki/User:TheBrain - https://commons.wikimedia.org/wiki/File:MRI_head_side.jpg#file, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=53940498

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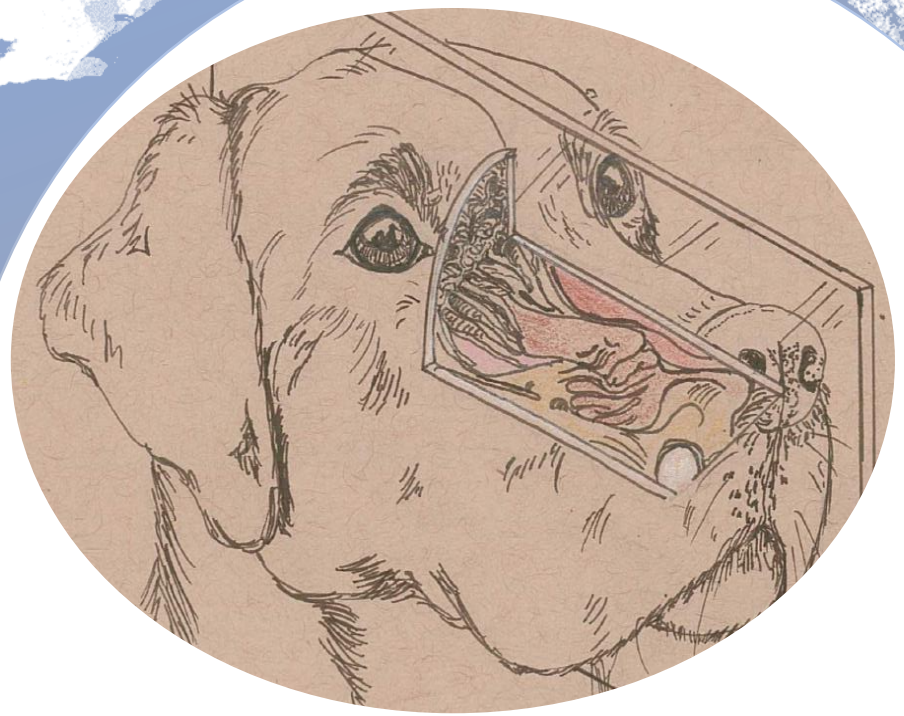
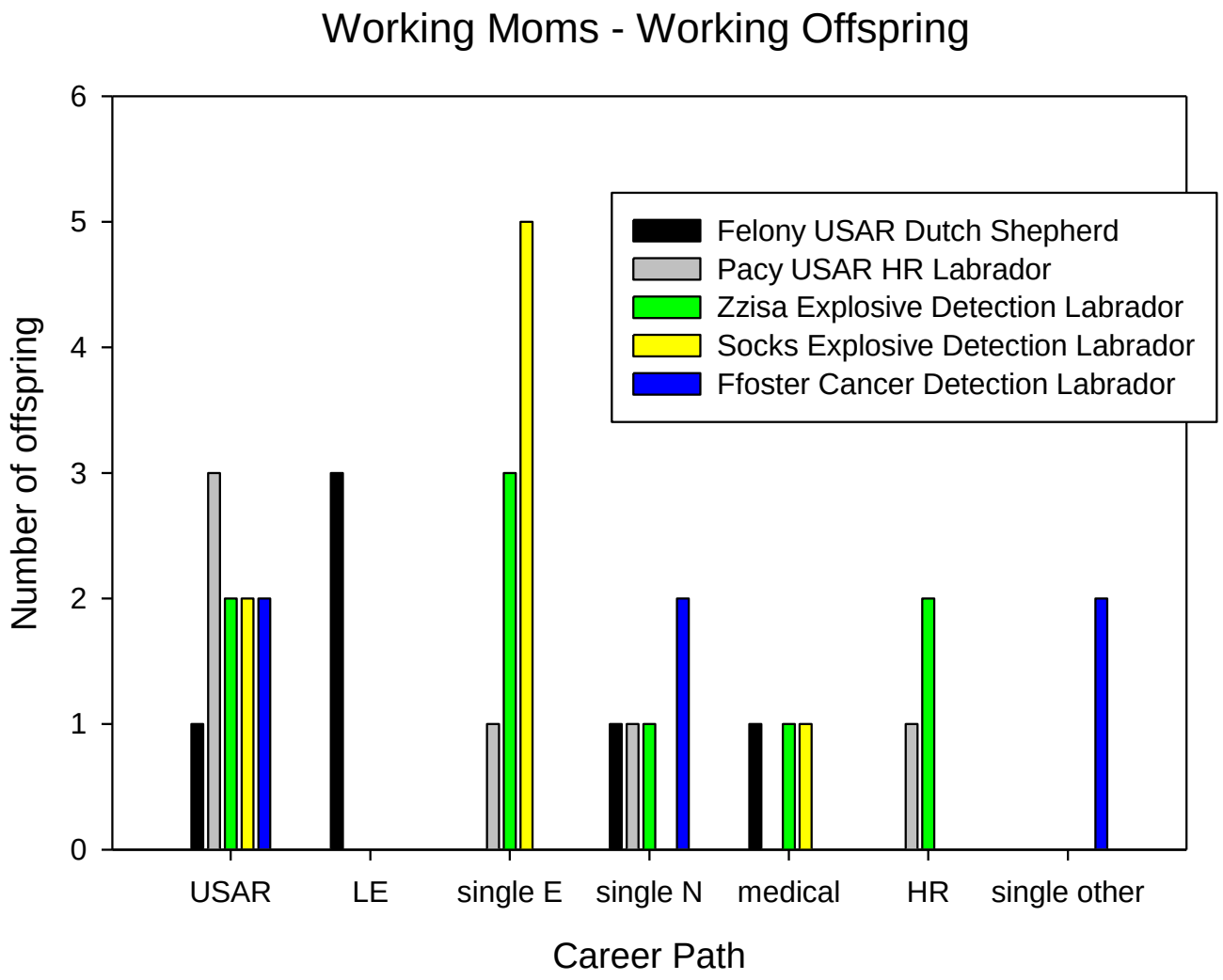



5053
966

Maternal influence?



Prenatal & Perinatal Odor Exposure

- Increases odor memory
- For good or for bad!

Lui 2016 J Neurosci
Dias 2014 Nature Neurosci

Puppy exposure

More is not always better . . .

Continuous exposure to a single odor leads to adaptation and decreased odorant's targeted glomeruli

Monjaraz-Fuentes Brain Research 1670 (2017) 6–13

http://maxpixel.freegreatpicture.com/Head-Dog-Anatomy-Nasal-Cavity-Sagittal-Section-114077

Wei 2008 Zoologic Research

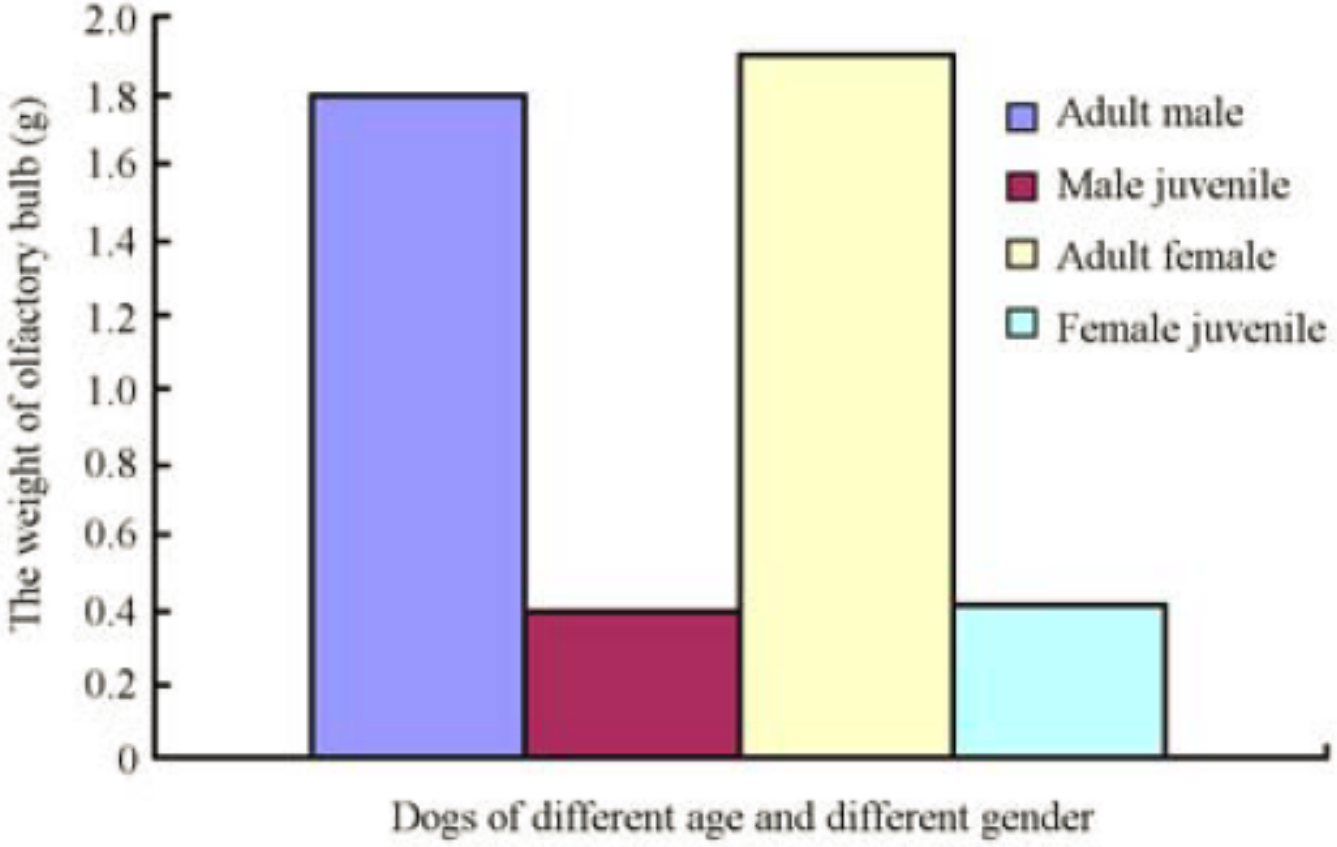


Fig. 1 Comparison of olfactory bulb's weight between dogs of different ages and sexes

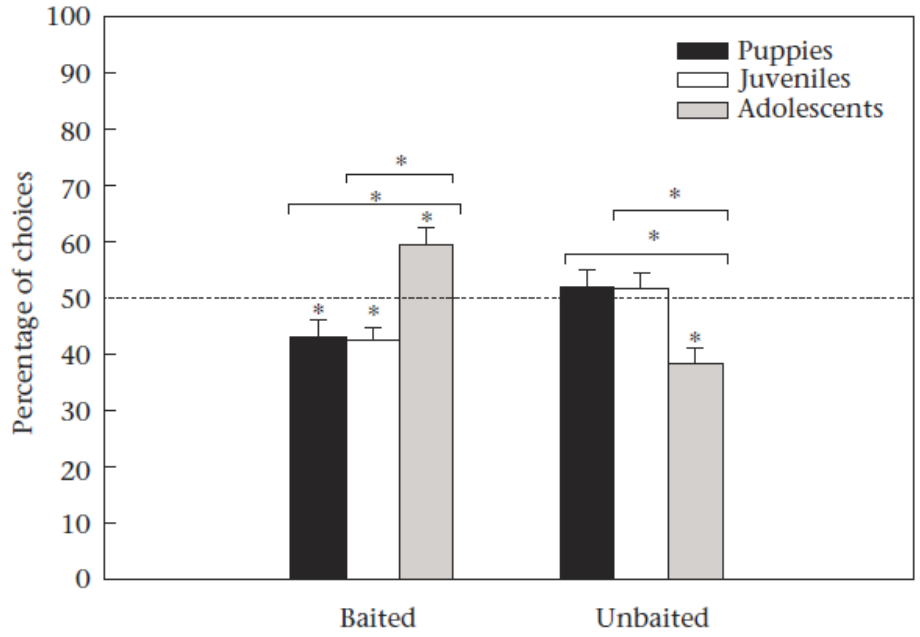


Figure 2. Percentage of responses to each cue as a function of age. Dashed line represents chance (50%). Asterisks indicate performance statistically different from chance or between groups (*$P < 0.05$). Error bars are standard errors of the mean.

Age and Independent Search

Lazarowski Animal Behavior 2019

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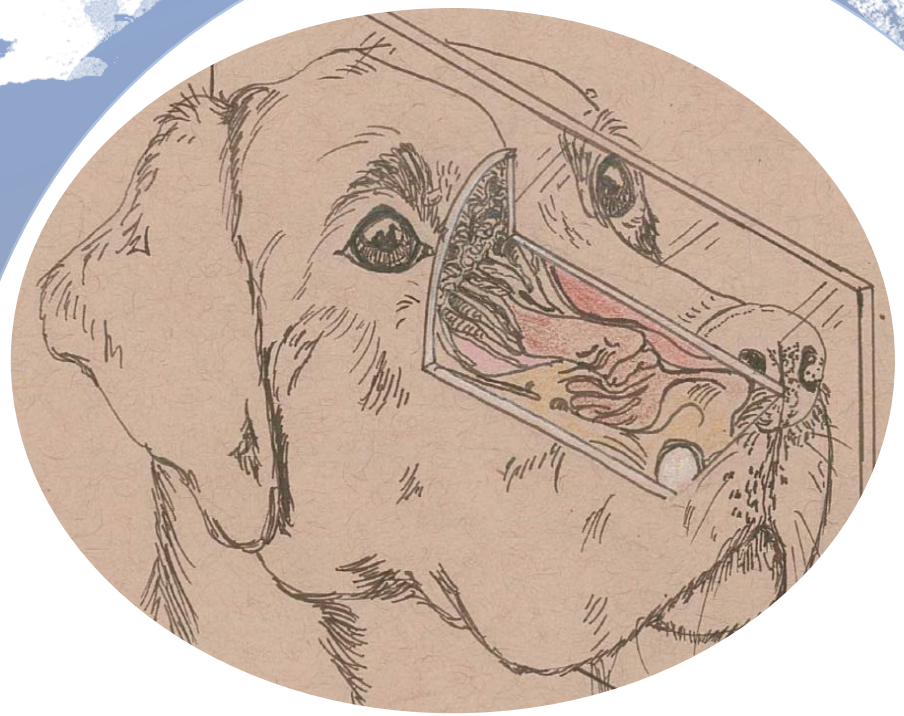
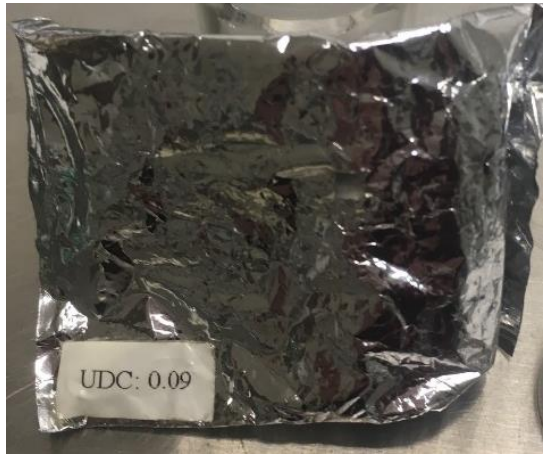
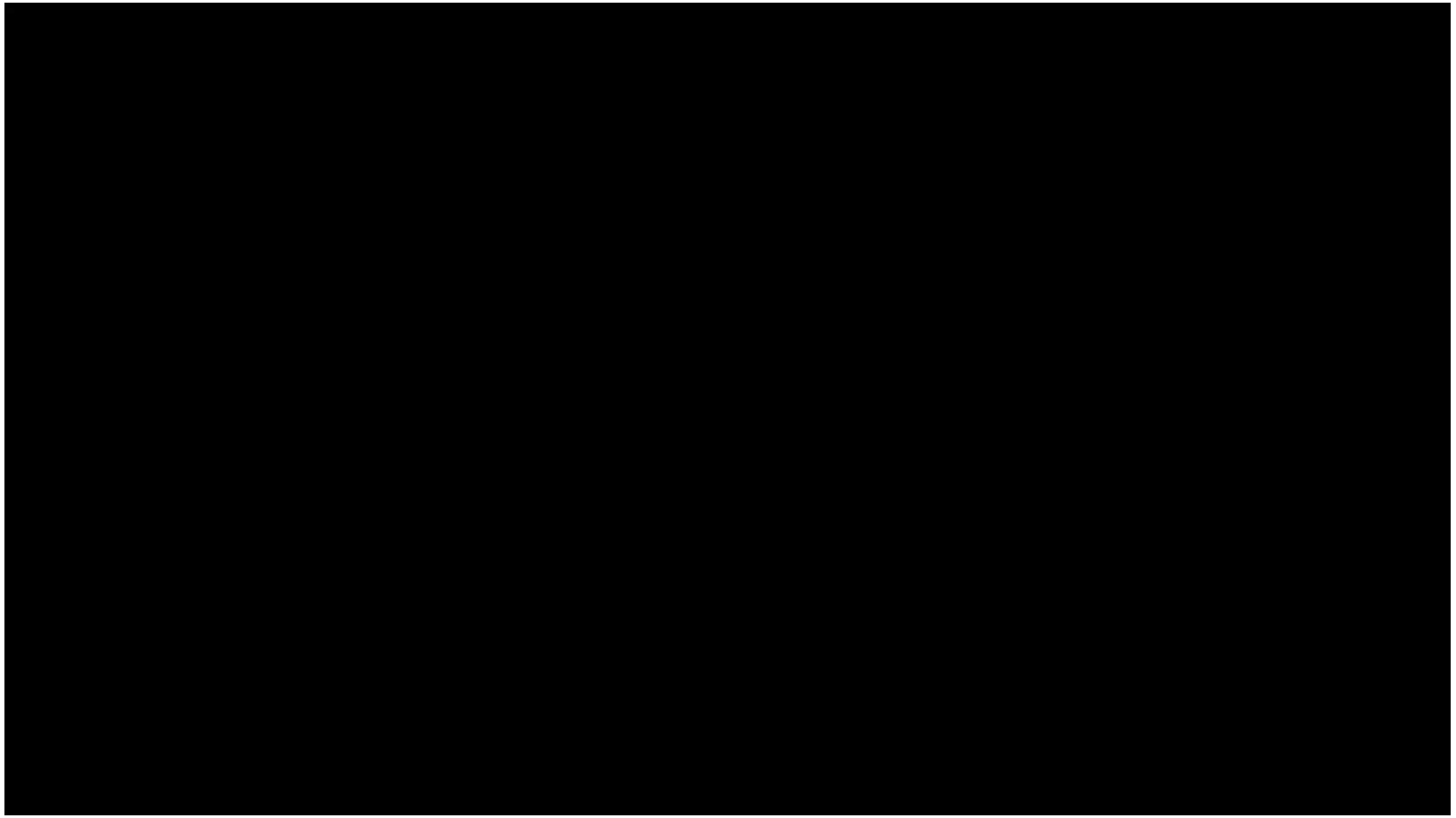


Universal detection compound (UDC)

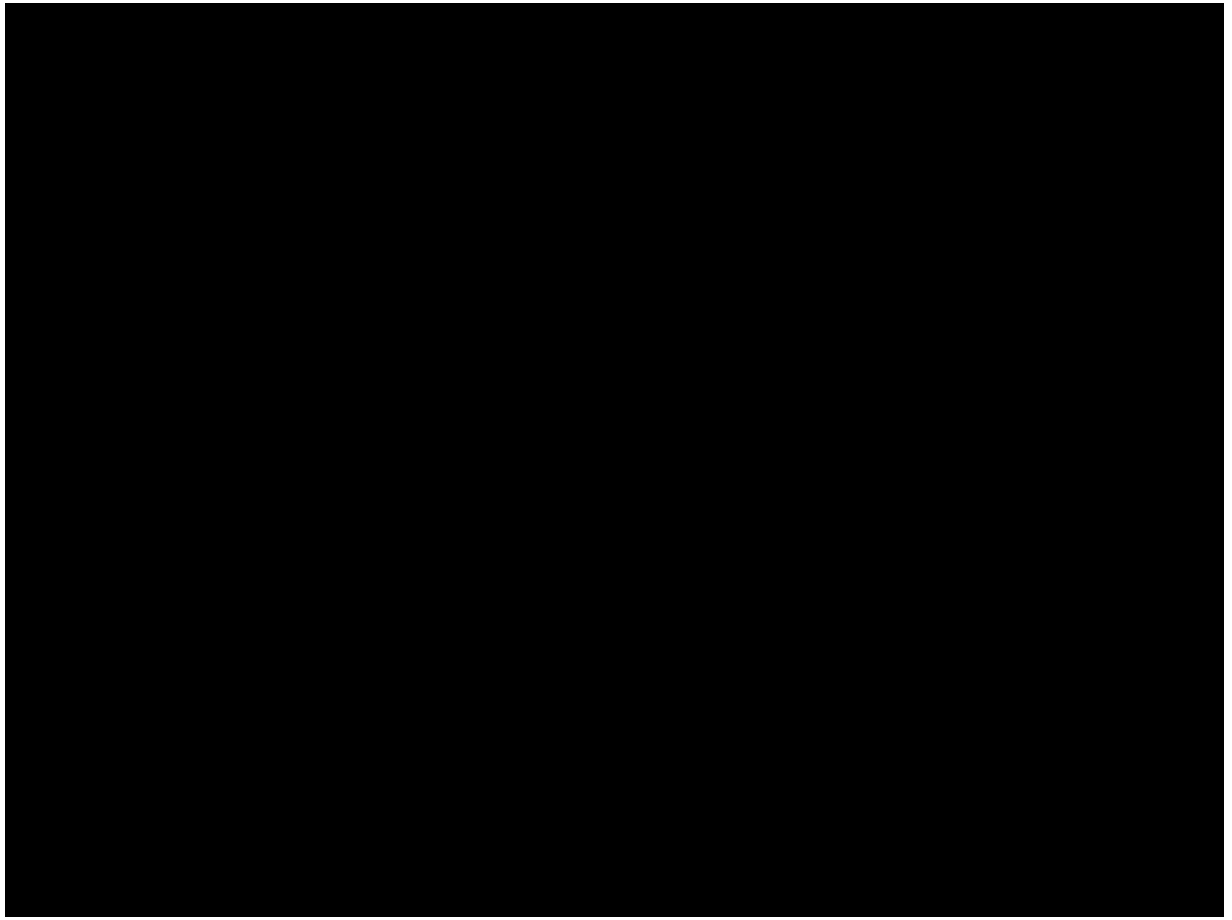
- Universal detection compound (UDC)
  - Synthesized unique chemical
    - Ken Furton, PhD, Florida International University
  - Allows odor threshold testing
    - Known odor dissipation rates
  - Allows dogs to learn search behaviors, prior to committing to career odor



imprinting



searching



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20|20 CLEAR VISION for training the K9 team

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April 24-27, 2020

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