

# Revealing Spatiotemporal Circuit Information of Olfactory Bulb in Large-scale Neural Recordings

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The Manuscript Microscope Sentence Audit is a research paper introspection system that parses the text of your manuscript into minimal sentence components for faster, more accurate, enhanced proofreading.

## Why use a Sentence Audit to proofread your manuscript?

- **Accelerated Proofreading:** Examine long technical texts in a fraction of the usual time.
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- **Easier Proofreading:** Take the hardship out of crafting academic papers.

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Bonus 3: **Improved Reputation:** Become known for rigorously precise publications.

**Manuscript Source:** <https://www.biorxiv.org/content/10.1101/2021.03.05.434081v1>

**Manuscript Authors:** Xin Hu, Shahrukh Khanzada, Diana Klütsch, Federico Calegari & Hayder Amin

### Features of the Sentence Audit:

The Sentence Audit combines two complementary proofreading approaches:

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The Minimal Sentence Components shown are the smallest coherent elements of each sentence of your text as derived from it's conjunctions, prepositions and selected punctuation symbols (i.e. commas, semicolons, round and square brackets).

The combined approaches ensure easier, faster, more effective proofreading.

### Comments and Caveats:

- The sentence parsing is achieved using a prototype natural language processing pipeline written in Python and may include occasional errors in sentence segmentation.
- Depending on the source of the input text, the Sentence Audit may contain occasional html artefacts that are parsed as sentences (E.g. "Download figure. Open in new tab").
- Always consult the original research paper as the true reference source for the text.

### Contact Information:

To get a Manuscript Microscope Sentence Audit of any other research paper, simply forward any copy of the text to [John.James@OxfordResearchServices.com](mailto:John.James@OxfordResearchServices.com).

All queries, feedback or suggestions are also very welcome.

### Research Paper Sections:

The sections of the research paper input text parsed in this audit.

[illegible]

Title      **Revealing Spatiotemporal Circuit Information of Olfactory Bulb in Large-scale Neural Recordings**

**S1 [001]      ABSTRACT**

**S1 [002]**      Large-scale multi-site biosensors are essential to probe the olfactory bulb (OB) circuitry for understanding the spatiotemporal dynamics of simultaneous discharge patterns.

Large-scale multi-site biosensors are essential ...  
... to probe the olfactory bulb ...  
... (OB) ...  
... circuitry ...  
... for understanding the spatiotemporal dynamics ...  
... of simultaneous discharge patterns.

**S1 [003]**      Current ex-vivo electrophysiological techniques are limited to recording a small set of neurons and cannot provide an inadequate resolution, which hinders revealing the fast dynamic underlying the information coding mechanisms in the OB circuit.

Current ex-vivo electrophysiological techniques are limited ...  
... to recording a small set ...  
... of neurons ...  
... and cannot provide an inadequate resolution, ...  
... which hinders revealing the fast dynamic underlying the information coding mechanisms ...  
... in the OB circuit.

**S1 [004]**      Here, we demonstrate a novel biohybrid OB-CMOS platform to decipher the cross-scale dynamics of OB electrogenesis and quantify the distinct neuronal coding properties.

Here, ...  
... we demonstrate a novel biohybrid OB-CMOS platform ...  
... to decipher the cross-scale dynamics ...  
... of OB electrogenesis ...  
... and quantify the distinct neuronal coding properties.

**S1 [005]**      The approach with 4096-microelectrodes offers a non-invasive, label-free, bioelectrical imaging to decode simultaneous firing patterns from thousands of connected neuronal ensembles in acute OB slices.

The approach ...  
... with 4096-microelectrodes offers a non-invasive, ...  
... label-free, ...  
... bioelectrical imaging ...  
... to decode simultaneous firing patterns ...  
... from thousands ...  
... of connected neuronal ensembles ...  
... in acute OB slices.

- S1 [006]** The platform can measure spontaneous and drug-induced extracellular field potential activity.
- The platform can measure spontaneous ...  
... and drug-induced extracellular field potential activity.
- S1 [007]** We employ our OB-CMOS recordings to perform multidimensional analysis to instantiate specific neurophysiological metrics underlying the olfactory spatiotemporal coding that emerged from the OB interconnected layers.
- We employ our OB-CMOS recordings ...  
... to perform multidimensional analysis ...  
... to instantiate specific neurophysiological metrics underlying the olfactory spatiotemporal coding ...  
... that emerged ...  
... from the OB interconnected layers.
- S1 [008]** Our results delineate the computational implications of large-scale activity patterns in functional olfactory processing.
- Our results delineate the computational implications ...  
... of large-scale activity patterns ...  
... in functional olfactory processing.
- S1 [009]** The high-content characterization of the olfactory circuit could benefit better functional interrogations of the olfactory spatiotemporal coding, connectivity mapping, and, further, the designing of reliable and advanced olfactory cell-based biosensors for diagnostic biomarkers and drug discovery.
- The high-content characterization ...  
... of the olfactory circuit could benefit better functional interrogations ...  
... of the olfactory spatiotemporal coding, ...  
... connectivity mapping, ...  
... and, ...  
... further, ...  
... the designing ...  
... of reliable ...  
... and advanced olfactory cell-based biosensors ...  
... for diagnostic biomarkers ...  
... and drug discovery.

## **S2 [010] INTRODUCTION**

- S2 [011]** The olfactory bulb (OB) is a vital chemosensory structure of the information coding mechanisms<sup>1</sup>.
- The olfactory bulb ...  
... (OB) ...  
... is a vital chemosensory structure ...  
... of the information coding mechanisms<sup>1</sup>.

**S2 [012]** It allows vertebrates to process and discriminate vast complex odorants and distinguish them with high selectivity and sensitivity<sup>2,3</sup>.

It allows vertebrates ...  
... to process ...  
... and discriminate vast complex odorants ...  
... and distinguish them ...  
... with high selectivity ...  
... and sensitivity<sup>2,3</sup>.

**S2 [013]** The OB's neuronal processes are distributed intricately, composed of an abundance of dendrodendritic interactions and a stratified structure in five connected layers<sup>4,5</sup>.

The OB's neuronal processes are distributed intricately, ...  
... composed ...  
... of an abundance ...  
... of dendrodendritic interactions ...  
... and a stratified structure ...  
... in five connected layers<sup>4,5</sup>.

**S2 [014]** The OB also renders a distinctive form of morpho-functional neuronal plasticity conferred by a constant supply of new neurons (i.e., adult neurogenesis), allowing profound remodeling of the bulbar circuit in response to experience and challenges<sup>6</sup>.

The OB also renders a distinctive form ...  
... of morpho-functional neuronal plasticity conferred ...  
... by a constant supply ...  
... of new neurons ...  
... (i.e., adult neurogenesis), ...  
... allowing profound remodeling ...  
... of the bulbar circuit ...  
... in response ...  
... to experience ...  
... and challenges<sup>6</sup>.

**S2 [015]** This organization represents a high degree of plasticity and is the first relay station of olfactory perception with downstream information processing from the primary sensory epithelium to high-order neurons in subcortical and cortical areas for odor identification and interpretation<sup>7–9</sup>.

This organization represents a high degree ...  
... of plasticity ...  
... and is the first relay station ...  
... of olfactory perception ...  
... with downstream information processing ...  
... from the primary sensory epithelium ...  
... to high-order neurons ...  
... in subcortical ...  
... and cortical areas ...  
... for odor identification ...  
... and interpretation<sup>7–9</sup>.

**S2 [016]** This high dimensionality of olfactory processing and odor coding properties inspired the development of biomimetic olfactory sensors, i.e., electronic noses<sup>10–12</sup>.

This high dimensionality ...  
... of olfactory processing ...  
... and odor coding properties inspired the development ...  
... of biomimetic olfactory sensors, ...  
... i.e., ...  
... electronic noses<sup>10–12</sup>.

**S2 [017]** They promise potential advances in medical diagnosis, food quality, environmental, and military applications<sup>13</sup>.

They promise potential advances ...  
... in medical diagnosis, ...  
... food quality, ...  
... environmental, ...  
... and military applications<sup>13</sup>.

**S2 [018]** However, a fundamental inherent shortfall in these electronic nose systems is the lack of realistic dynamics at the physiological cellular and network levels, thus hindering this technology's exploitation for further challenging applications<sup>14</sup>.

However, ...  
... a fundamental inherent shortfall ...  
... in these electronic nose systems is the lack ...  
... of realistic dynamics ...  
... at the physiological cellular ...  
... and network levels, ...  
... thus hindering this technology's exploitation ...  
... for further challenging applications<sup>14</sup>.

**S2 [019]** Hence, considerable achievements in genetic, biotechnology, and bioengineering have been put forth to enable the implementation of olfactory cell-based biosensors (i.e., bioelectronic noses)<sup>14,15</sup> to circumvent the limitations of conventional electronic noses and to promote specific measurement of target odorants<sup>16</sup>.

Hence, ...  
... considerable achievements ...  
... in genetic, ...  
... biotechnology, ...  
... and bioengineering have been put forth ...  
... to enable the implementation ...  
... of olfactory cell-based biosensors ...  
... (i.e., bioelectronic noses)<sup>14,15</sup> ...  
... to circumvent the limitations ...  
... of conventional electronic noses ...  
... and to promote specific measurement ...  
... of target odorants<sup>16</sup>.

**S2 [020]** In this context, many studies have been reported to employ a range of different olfactory cell-based biosensors<sup>16–18</sup>.

In this context, ...

## **End of Sample Audit**

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This is a truncated Manuscript Microscope Sample Audit.

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