



Capturing the Semantics of Smell

*The Odeuropa Data Model for
Olfactory Heritage Information*

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Some Credits

Pasquale Lisena, Daniel Schwabe, Marieke van Erp, Raphaël Troncy, William Tullett, Inger Leemans, Lizzie Marx, and Sofia Colette Ehrich. 2022. **Capturing the Semantics of Smell: The Odeuropa Data Model for Olfactory Heritage Information.**

In *The Semantic Web: 19th International Conference, ESWC 2022*, Hersonissos, Crete, Greece, May 29 – June 2, 2022. https://doi.org/10.1007/978-3-031-06981-9_23

Pasquale Lisena, Thibault Ehrhart, and Raphaël Troncy. 2025 **How to Embed Large but Incomplete Knowledge Graphs in the Culture Heritage Sector: Lessons Learned from Odeuropa.** *Handbook on Neurosymbolic AI and Knowledge Graphs*. IOS Press, 2025. 146-165.

<https://doi.org/10.3233/FAIA250205>



Odeuropa

Why Olfaction?

classic

Domain-specific terminology & knowledge

hydrolytic

fresh

sweet

aldehyde

rich

volatiles

tones

blueberries

bursts

pungent

flavour

corpulent

sweet

gasoline-like

woody

citrus

medicinal

Perfume makers

Wine sommeliers

Chemists

Lisena et al. (2021) **Data Mining and Knowledge Graphs as a Backbone for Advanced Olfactory Experiences**. In *STT21: Smell, Taste, and Temperature Interfaces workshop*

Stakeholders

- Perfume-making
- **Olfactory Heritage**
- Scholar
- GLAMS
- Human Computer Interfaces
- Urban design
- **Tourism**
- **Environment preservation**

PRESS RELEASE

Perfume-related know-how in Pays de Grasse recognised as an intangible cultural heritage of humanity by UNESCO

HERITAGE

INTANGIBLE CULTURAL HERITAGE

Published on 28.11.2018



French MPs were spurred to "protect the sensory heritage" of the countryside after outsiders complained about the way of life
ALAMY

Law protects rural smells in France

Charles Bremner, Paris

Friday January 22 2021, 12:01am GMT, The Times



the japan times



NATIONAL

Ministry compiles list of nation's 100 best-smelling spots

SHARE Oct 31, 2001

Sulfurous hot springs, lavender blossoms, grilled eel



Ms. Tarantula (official) @fortuneontwit
I lost my smell

1



MamaPyjama @MamaPyjama2 · 15 mag

Aw crap. I've **lost** my senses of **smell** and taste. I'm going to try really hard to not get depressed about this but for people who know me I'm, like, *extremely* food motivated.



bella ross @bellamayara
Welp... day 4 of being s
smell

6



Dhruvajyoti Deka @Djdhruba2 · 24 set 2020

I didn't understand how **important smell** is

Until I **lost** it today.

17



44

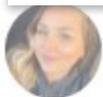


alex @amrakow · 22 mag

t my taste and **smell** :(



8



Sarah Coulter @sarahcoulter
I have absolutely **lost** all
never recover

2



Howard Pinsky @Pinsky · 15 mag

I was hoping we were just dealing with the flu but my wife and I got hit with
both my taste



Anosmia And Me @AnosmiaM · 27 feb 2021

When you have **lost** your sense of **smell** 'memory' smells are so important.

They connect you to your past. [#lossofsmell](#) [#anosmia](#)

[#anosmiaawarenessday](#)



Ken Reid
For the "CO
COVID in the last six months who **lost** their sense of **smell** and taste and
NEVER got it back. That's literally 40% of your physical senses gone. That's
a life long disability

3

14

57



1



2



I have **lost** my senses to taste and **smell** hope this is temporary

*What are the **most frequent** smell sources in **London** in the 18th century?*

*When did the smell of **pollution** start to be mentioned?*

Centuries of collective smell memories



Heritage

*What smells were perceived during the **Waterloo Battle**?*

*What **emotions** were associated with floral smells in the 19th century?*

*How have the **adjectives** used for describing a smell change over time?*

PARRY'S
CYCLOPÆDIA
OF
PERFUMERY

A HANDBOOK

On the Raw Materials used by the Perfumer, their
Origin, Properties, Characters and Analysis; and
on other subjects of Theoretical and Scientific
Interest to the User of Perfume Materials, and to
those who have to Examine and Value such Materials

ERNEST
in the
Analytical

OSPHRÉSIOLOGIE,
OU

TRAITÉ DES ODEURS, DU SENS ET DES ORGANES
DE L'OLFACTION;

AVEC L'HISTOIRE DÉTAILLÉE DES MALADIES DE NEZ ET DES SENSÉS PARALÉS,
ET DES OPÉRATIONS QUI LEUR SONT CONNEXES;

PAR HIPPOL. CLOQUET.

J. B.

Docteur en médecine de la Faculté de Paris, Médecin titulaire de l'Hospice royal de
Médaille d'Or de la Faculté de Médecine de Paris, Médecin titulaire de l'École royale de
Médecine de la même ville, et de la Société royale et de la Société des médecins d'Orange
Membre correspondant de la Société de Médecine de New-York, de celle des sciences et de celle
de la Faculté de Médecine de Montpellier, et de la Société de Médecine de la Faculté de
Médecine de la Faculté royale de Paris, Médecin de l'Hospice de Charité de Paris, etc., etc.

Et rédigé par un des plus célèbres
MÉDECINS DE PARIS.

SECONDE ÉDITION.
ENTièrement révisée et considérablement augmentée.



A PARIS,
CHEZ MÉQUIGNON-MARVIS, LIBRAIRE
POUR LA PARTIE DE MÉDECINE,
RUE DE L'ÉCOLE DE MÉDECINE, N° 5.
1821.

Text

Centuries of collective smell memories



Heritage



Images

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1821.

Text

Knowledge

Graph

Query + AI



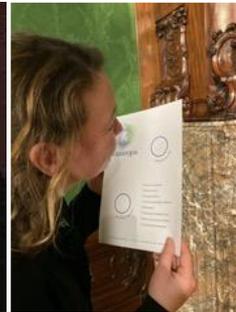
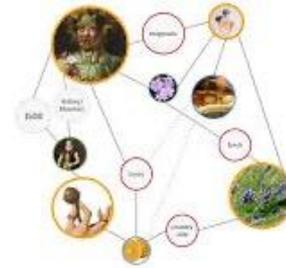
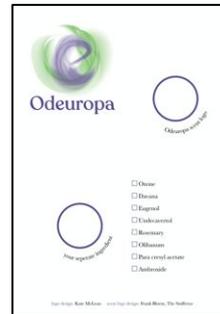
Images

Objectives:

- ❖ develop state-of-the-art **AI techniques** to **identify olfactory information in digital text and image collections**; to curate historical **olfactory narratives**
- ❖ recognize, safeguard, and promote **olfactory heritage**
- ❖ to show that critically engaging our sense of smell & olfactory heritage is viable means for **connecting and promoting Europe's tangible and intangible cultural heritage**



Partners: 7 (6 countries)
 Period: 2021-2023



State of Art

We can find KG, ontologies or data models representing:

Disciplines

- ✓ Cultural Heritage
- ✓ History
- ✓ Art
- ✓ Chemistry
- ✓ Scientific Observation

Senses

- ✓ Vision / Images
- ✓ Hearing / Sounds
- ✓ Taste
- ☐ Olfaction
(only from a chemical perspective)

- Olfactory experiences
- Sensory experiences

Design Methodology

Competency questions (CQ)

74 questions, organised in 7 categories
defined by olfactory experts (history and heritage domain)

1. Smells

What smells were significant in the past?

2. Noses

How did people use their noses in the past and what types of smell expertise or experience can we find?

3. Identities

What meaning did smells have and how did they communicate identities or stereotypes?

4. Emotions

What feelings were associated with smells in parts of Europe at different times?

5. Practices

What kinds of practices produced smells?

6. Sites and contexts

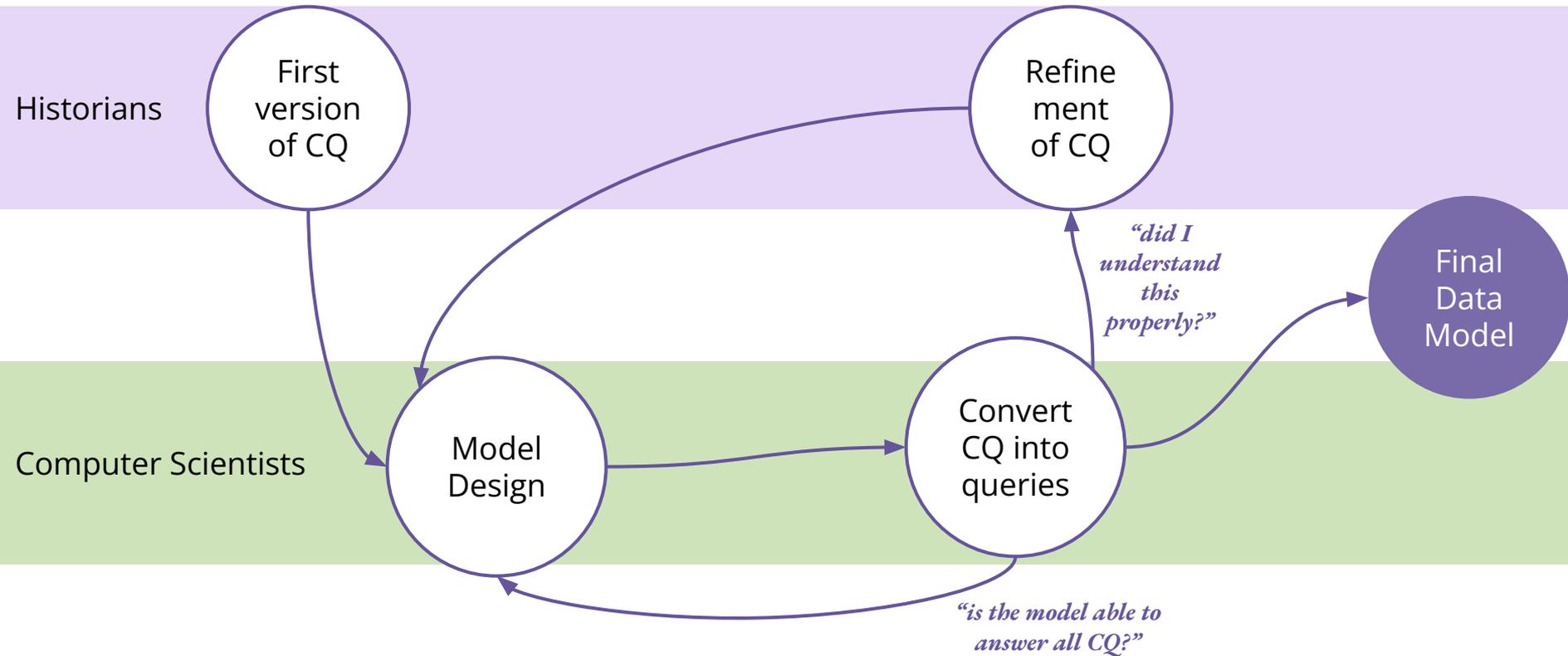
Which communities, institutions, or spaces were associated with particular smells?

7. Texts and images

How smells are represented in texts and images?

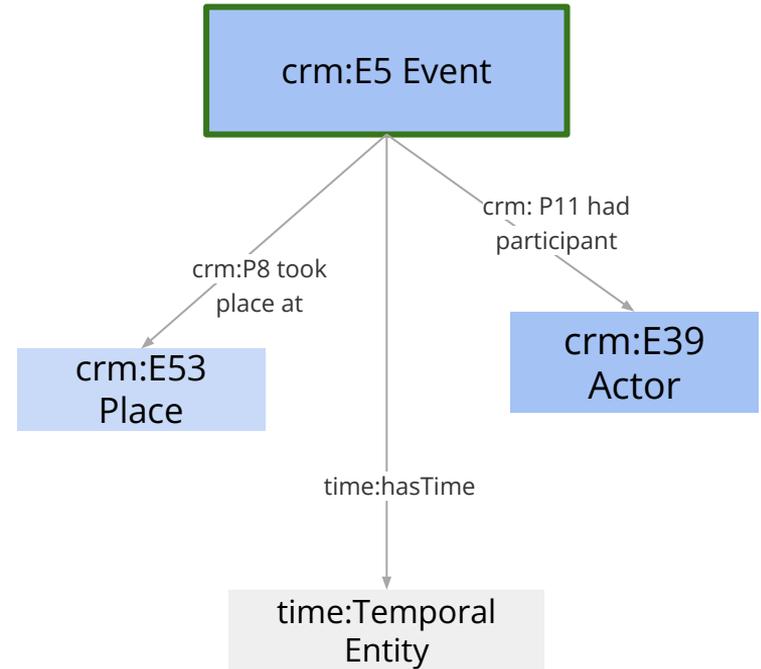


Collaboration between Disciplines



Extending CIDOC CRM and CRMsci

- CIDOC-CRM is an **event-based ontology**
 - Everything exists through an event (birth, production, etc.)
- Already **familiar** within Cultural Institutions
- It is a **bridge** to other cultural and heritage objects
- It is **expressive** and **flexible**
- It has an extension covering Scientific Observation: CRMsci



Reused Ontologies

We extend

CIDOC CRM	Cultural Objects + Event structure
CRMsci	Scientific observation extension of CIDOC CRM

We re-use

Time Ontology	Temporal information
FOAF	Person representation
PROV-O	Data provenance
Schema.org	Genre and Authors of text/painting
READ-IT	Emotions triggered by events

The Odeuropa Data Model

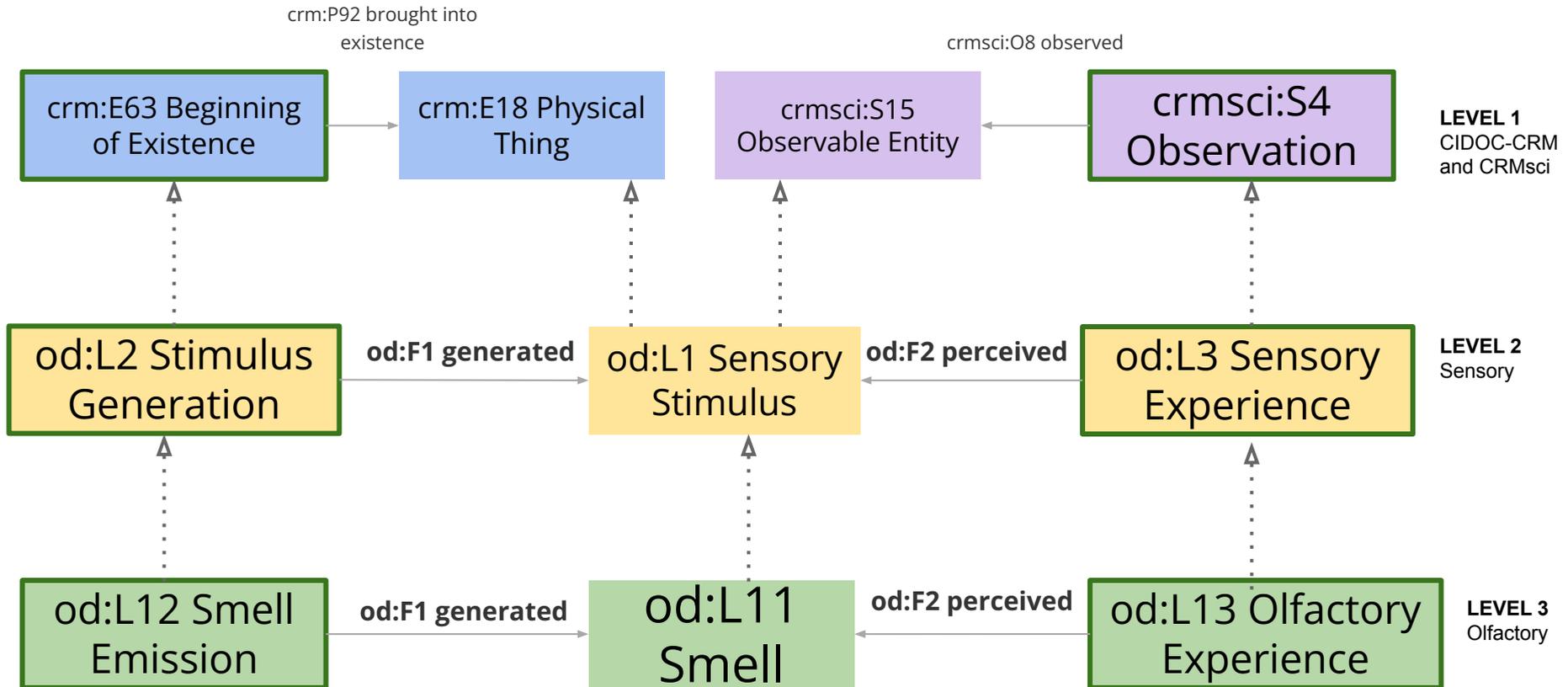
Core



Event

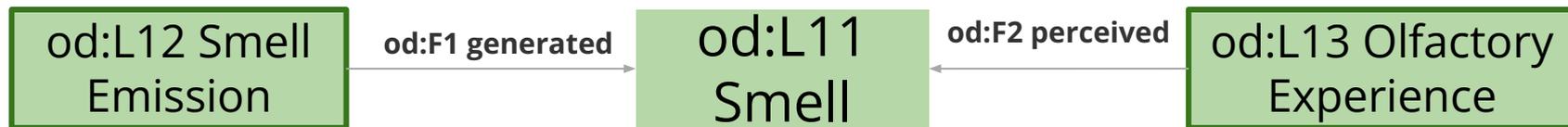


subclass of
property



What is a Smell?

- In this model, we consider a **smell as a unique and non-repeatable entity**
 - Two roses have two distinct (but similar) smells
 - A smell is normally connected to time and space
 - The “smell of roses” exists only as a generalisation of the smells of all roses
- A given smell can be experienced by multiple people
 - Each person can describe the same smell differently



What the model enables to represent

Smell
Emission

Olfactory
Experience

Odorizing

- Provenance of the information (which document, which tool)
 - Space & Time
 - Co-occurring event

- **Source**
- **Carrier**
- Smell Transformation
- Smells Interaction
- Connection with multiple experiences

- Perceiver
- **Gesture**
- **Attributes** used for describing it
- **Emotion**
- Evoked entities
- Multi-sensory experiences

- User
- Technique
- Purpose

Controlled vocabularies

Multilingual Vocabularies (6 langs)

realised during the project



Olfactory Objects

682 Concepts



Olfactory Gestures

36 Concepts

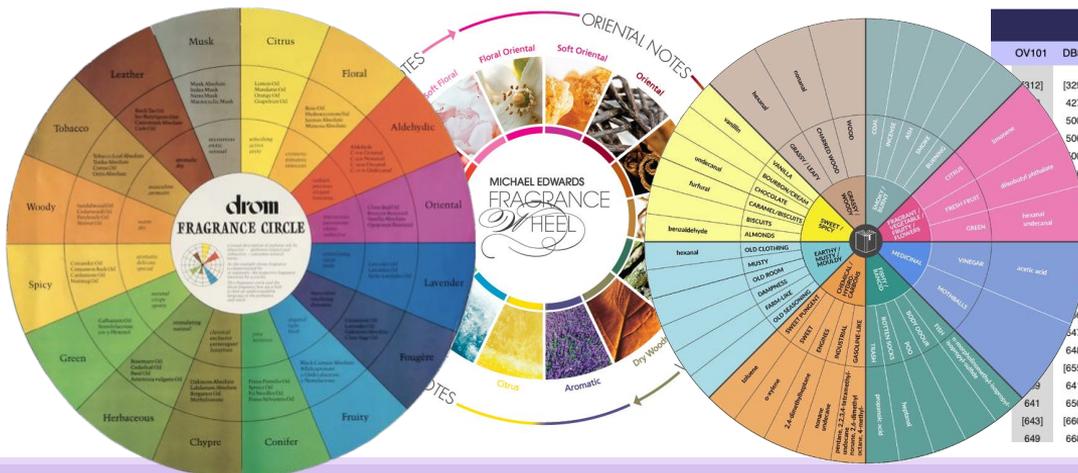


Fragrant spaces

137 Concepts

- hierarchy
- bridges between vocabularies
- interlinks with Wikidata and Iconclass

Olfactory taxonomies integrated in the system



Flavornet Home					Kovats RI	
OV101	DB5	OV17	C20M	Odorant	Odor	
[329]	[329]	[420]	677	trimethylamine	fish	
427	[518]	714	ethanol	ethanol	pungent, ether	
500	[591]	696	methanethiol	methanethiol	sulfur, gasoline, ga	
506	[597]	571	propanal	propanal	solvent, pungent	
500	500	500	pentane	pentane	alkane	
5	[827]	1037	propanol	propanol	alcohol, pungent	
	[596]	716	dimethyl sulfide	dimethyl sulfide	cabbage, sulfur, ga	
	[591]	848	ethyl formate	ethyl formate	pungent	
	[688]	[945]	methyl ethyl ketone	methyl ethyl ketone	ether	
	[700]	[957]	methyl ethyl sulfide	methyl ethyl sulfide	sulfur, garlic	
	600	600	hexane	hexane	alkane	
	[719]	907	ethyl acetate	ethyl acetate	pineapple	
	[711]	[968]	methylbutenol	methylbutenol	herb	
	[6]	[727]	984	pentanone	ether	
	547	[738]	1099	isobutanol	wine, solvent, bitter	
	648	[739]	1047	trans-crotonaldehyde	flower	
	[655]	[746]	1003	methylpentanone	mint	
	641	729	912	methylbutanal	cocoa, almond	
	641	650	728	910	methylbutanal	malt
	[643]	[660]	[751]	1008	pyrrolidine	alkaline
	649	668	17591	929	ethanol	sweet

16 New Classes

LEVEL 2 Sensorial

- L1 Sensory Stimulus
- L2 Stimulus Generation
- L3 Sensory Experience
- L4 Stimuli Transformation
- L5 Stimuli Interaction
- L6 Animal
- L7 Gesture

LEVEL 3 Olfactory

- L11 Smell
- L12 Smell Emission
- L13 Olfactory Experience
- L14 Smell Transformation
- L15 Smell Interaction
- L16 Odorizing

10 New Properties

LEVEL 2 Sensorial

- F1 generated
- F2 perceived
- F3 had source
- F4 had carrier
- F5 involved gesture
- F6 evoked
- F7 has species

LEVEL 3 Olfactory

- F8 has nose quality
- F9 involved smell
- F10 targeted

A text example

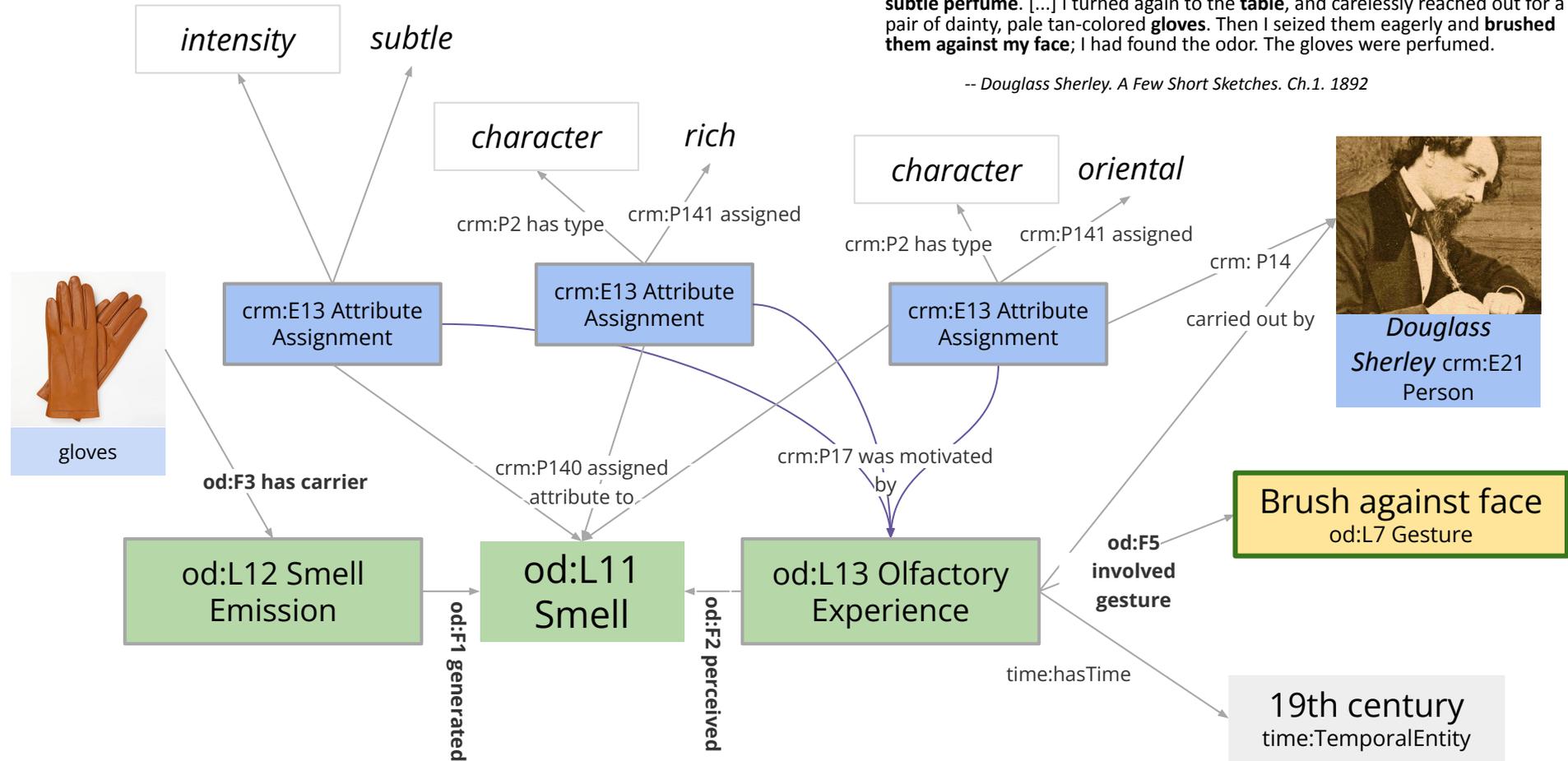
A text example

From somewhere there came a **rich oriental odor**. It intoxicated me with its **subtle perfume**. [...] I turned again to the **table**, and carelessly reached out for a pair of dainty, pale tan-colored **gloves**. Then I seized them eagerly and **brushed them against my face**; I had found the odor. The gloves were perfumed.

-- Douglass Sherley. A Few Short Sketches. Ch.1. 1892

From somewhere there came a **rich oriental odor**. It intoxicated me with its **subtle perfume**. [...] I turned again to the **table**, and carelessly reached out for a pair of dainty, pale tan-colored **gloves**. Then I seized them eagerly and **brushed them against my face**; I had found the odor. The gloves were perfumed.

-- Douglass Sherley. *A Few Short Sketches*. Ch.1. 1892



“Follow you nose” Exhibition at Ulm Museum

Title: Portrait of Helena Schermar

Date: c.1620

Creator: Andreas Schuch (c.1634–1680)

Medium: Oil on canvas



First let the gloues bee greate, and of good thicke leather, to the which you shall gyue a little **Ciuet** all alonge the seames: Than washe them in **rose water**, twice or thryse, pressing theym harde: this doen, take twoo partes of **rose water**, one parte of the **water of the blossoms of Mirtell** tree, mingle them together: addinge to it two partes of the **water of the flowres of Orenge, Lemons, & Citrons**, called of the Frēchmen, can de nafe, and washe them so long therwith, that they **sauour no moore of the leather** [...]

Than wil they bee **excellent**, as if it were to present an **emperour** withall.

-- Girolamo Ruscelli. The Secrets of the Reuerende Maister Alexis of Piemount. 1558



civet



rose water



dried rose



musk



amber



myrtle blossom water



orange flower water



Jasmine oil

od:L12 Smell Emission

od:L11 Smell

od:L14 Smell Transformation

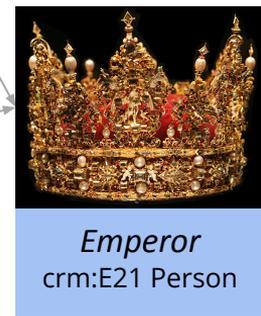
od:L11 Smell

od:L13 Olfactory Experience

crm:E13 Attribute Assignment

hedonic

excellent



Emperor
crm:E21 Person

od:F2 has source

od:F3 has carrier

od:F2 has source

crm:E29 Design or Procedure

od:F1 generated

crm:P140 assigned attribute to

od:F2 perceived

crm:P17 was motivated by

crm:P2 has type

crm:P141 assigned

crm:P14 carried out by

Evaluation

Evaluation through Competency Questions

Category	Answerable by the model 	More AI needed 	Answerable including external knowledge 	Require model extension 	TOT
A. Smells	10	0	0	1	11
B. Noses and Gestures	6	0	0	0	6
C. Identities	6	0	0	0	6
D. Emotions	6	0	0	0	6
E. Practices	8	5	0	0	13
F. Sites and contexts	9	0	2	0	11
G. Texts and images	19	0	2	0	21

Was smell 1 perceived as more pleasant than smell 2?

Which smells were more perceived during morning?

Which smell was possible to perceive during a war?

The European Olfactory KG



ARTIST Philippe Jacques Van Brée
TITLE The Pasha's dogs
CREATION DATE 1823
SMELL SOURCE [Carcass](#), [Dog](#), [Water](#)

SEE MORE

STINKENDEN

Bemerkenswerth möchte es sein, dass alle Ortschaften, welche von der Cholera und dem Friesei heimgesucht wurden, keineswegs eine ungesunde Lage haben, sondern fern von Süm- pfen und **stinkenden** Was...

SEE MORE

PUTRIFIES

The tide not being now let in from the river either so often or so abundantly as formerly, the water in the remote ramifications of the stream scarcely covers the mud, is hardly ever properly renewed,...

PARFUMS

Cette Eau est un extrait concentré des **parfums** dont se servaient les anciens, et qui sont encore employés dans tout l'Orient; son odeur est douce et suave, et l'on s'en sert pour neutraliser les mauva...

- 6 languages
 - EN, IT, FR, DE, SL, NL
- 2.5M+ olfactory references
 - 2.4M from text
 - 43K from images
- Smell Explorer
 - Visualisation of the Graph
 - **Text search**
 - **Concept search** (language-agnostic)
 - **Overview page** for Smell Sources, Spaces and Gestures

Useful Links

- Ontology
 - OWL implementation
<http://data.odeuropa.eu/ontology/>
 - More detailed presentation
<https://bit.ly/odeuropa-model>
- Vocabularies (TTL + Skosmos + API)
<http://vocab.odeuropa.eu>
- Knowledge Graph
<http://data.odeuropa.eu>



All our demonstrators

bit.ly/odeuropa-images

smell-extractor.tools.eurecom.fr



Word	Frequency over 1000 words
rose	9.307737056428158
red	1.0005817335660268
water	1.0005817335660268
per-fume	0.6980602792321117
smell	0.605002066878301
fragrant	0.535194880744819
leave	0.4653868628214078
sweet	0.4653868628214078
damask	0.418848167539287
violet	0.34904013961005584

[ENGLISH] It's 1787, you are newly arrived in London, and you are walking the short distance from the Saracen's Head Inn to the nearby Newgate prison. As you pass the old Bailey courthouse, you catch a terrible smell. They tell you that the smell arose from the burning of a woman who had been found guilty of coining farthings. The public burning of women in England only ended in 1790, Catherine Hayes being the last such individual to be thus punished. Up until 1789, the scent of burnt flesh also appeared in the courtroom itself, where some malefactors might be branded with a hot iron - "T" for theft, "F" for felon, or "M" for murder. The smell of burning was a warning to others. But smell could also feature as part of the humiliation of legal or, in some cases, extra-judicial punishment.

encyclopedia.odeuropa.eu

bit.ly/odeuropa-text

The Odeuropa Smell Explorer
Explore Europe's Olfactory Heritage



explorer.odeuropa.eu

ENCYCLOPEDIA OF SMELL HISTORY AND HERITAGE

SEARCH REFRESH FILTERS ABOUT

Prisons

Created: 2024-07-14 14:41 | Edited: 2024-07-14 14:41

In summer 1924 the American judge Florence E. Allen took a trip to London and, whilst there, visited the metropolis' highest criminal court – the Old Bailey. To her surprise, as she entered the court room, she was given a bouquet of flowers and herbs. Once inside she found the floor strewn with dried rose petals and clover blossom. The visitor thought this a rather odd practice in a court of law. However, she was informed that it was a custom dating back to the eighteenth century, when fears of 'prison fever' had led to attempts to aromatize the courtroom. The new building in which the court was now located was far better ventilated, but the practice of proffering posies continued. Allen reflected that,

"I suppose we can have no real conception of what those old prisons were, but we know that they were reeking with dampness, and there was absolutely no sanitation in the modern sense, and a terrible stench came from the Old Bailey jail into the Old Bailey courtroom." (Allen 1925: 190)

Allen's remarks were not just deodorized modernity's enormous condescension for a smelly past; they had been echoed by historical visitors, inmates, and workers when they described prisons. When one writer looked back on the burning down of London's Newgate prison during the Gordon Riots of 1780, they considered it a 'great good' that the 'loathsome' building 'reeked with the moisture of prisoners' breaths, and redolent of the most unhealthy odours' had been demolished (Blanchard 1844).

In the 1780s Louis Sébastien Mercier wrote that Paris was filled with the smells of 'hospitals, stinking common sewers, urinous rivulets, excrementious accumulations, tanners, dyers, &c. in a constant smoke'. He described the city's atmosphere, whether you could 'breathe the rose smell' fresh air, as a 'prison' (Mercier, 1817). The idea of the prison smell was so common that it could thus be deployed as an analogy for other close, uncomfortable, and stagnant smells. The houses of the poor could be described similarly. In Balzac's 1834 work *Le Père Goriot*, he described the Place Maubert area as the most 'horrible' district of Paris where 'the walls smell of prison' (Balzac 1834).

What to do with the blotter

Option 1

Keep it!

*(note: your bag
may smell like a
17th century
leather glove)*

Option 2

Give them back to me!



Thank you



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