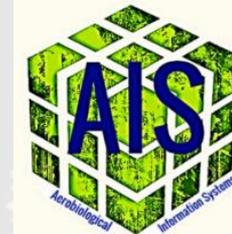




Aerobiological Information Systems and allergic respiratory disease management AIS LIFE (AIS LIFE LIFE13 ENV/IT/001107)



Conference:

Il monitoraggio aerobiologico a Pisa nell'ambito del progetto AIS LIFE

Aerobiological monitoring in Pisa within the AIS LIFE project

Franco Ruggiero - Gianni Bedini

Department of Biology – University of Pisa

Area della Ricerca CNR – Pisa

30 May 2017



Pollinosis

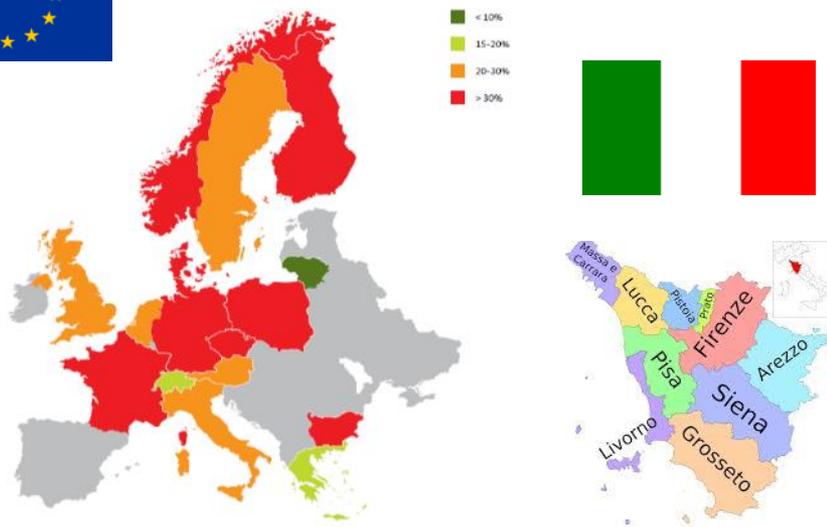
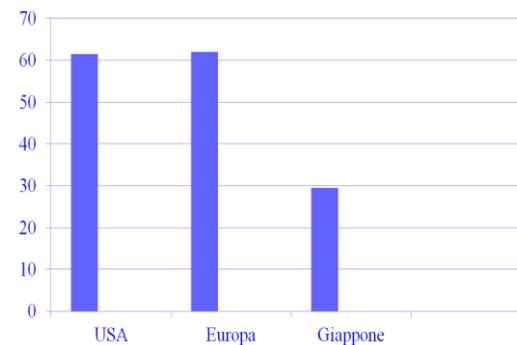


Chronic respiratory disease	Year of estimation	Prevalence	Reference
Asthma	2004	300 million	15
Chronic obstructive pulmonary disease	2000	210 million	30–32
Allergic rhinitis	1996–2006	400 million	33–37
Other respiratory diseases	2006	>50 million	38–44
Sleep apnea syndrome	1986–2002	>100 million	45–48



EFA: European Federation of Allergy and Airways Diseases Patients' Associations

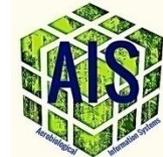
<http://www.efanet.org/>



- Prevalence of allergic rhinitis 25.8%
- 15 milioni of Italians suffer of pollinosis
- in Tuscany >700.000 people



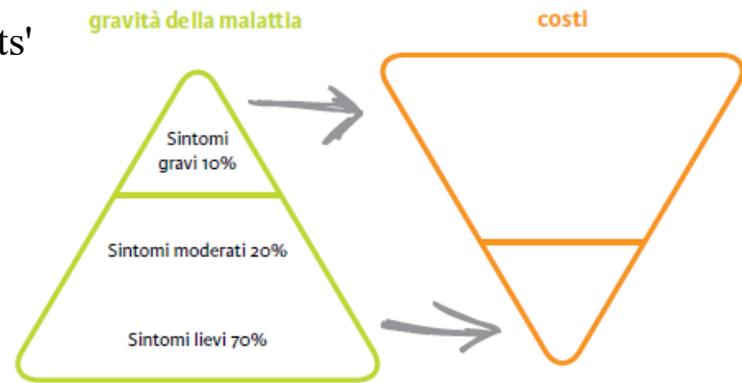
Social and economic impact



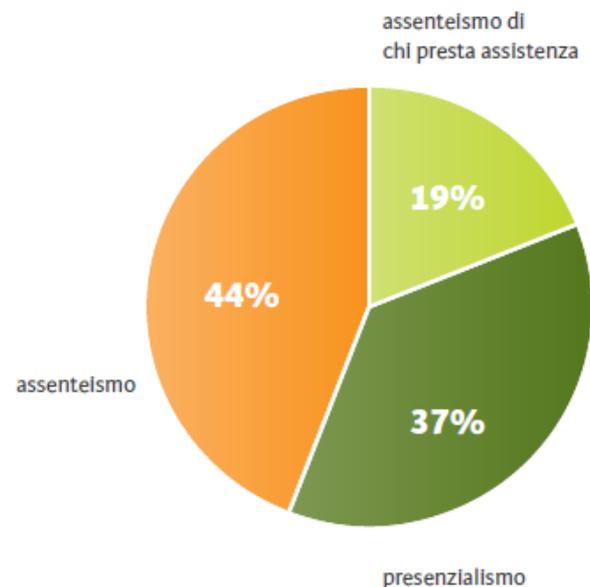
EFA: European Federation of Allergy and Airways Diseases Patients' Associations

Tabella 3. Costi diretti annuali per rinite allergica e asma nei paesi esaminati

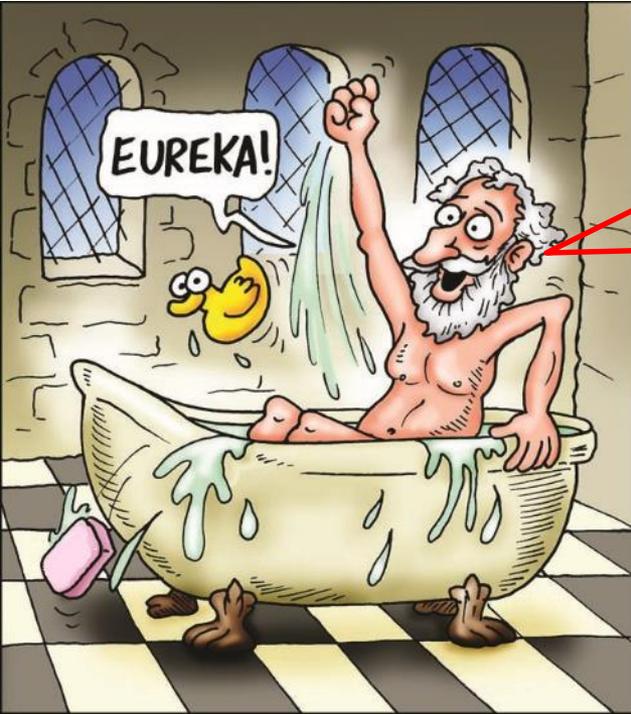
Paese	Rinite allergica moderata/grave	Asma allergica
Austria ¹	—	Tra € 220M e € 450M nel 2004 ²
Belgio	—	€ 2.441 per paziente (1996) ³
Danimarca ⁴	Diretti e indiretti: DKK 16.000 per paziente	Costi diretti e indiretti stimati DKK1,9 miliardi (2000)
Finlandia ⁵	€ 118M	€ 230M (2005) € 626 per paziente
Francia	—	€ 1,5 miliardi € 1.122 per paziente ⁶
Germania	€ 220M ⁷	—
Irlanda	—	€ 265 per paziente - stima del 2007 ⁸
Italia	€ 1.000 per paziente⁹	€ 1.400 per paziente¹⁰
Polonia	—	PLN 3.988 per paziente
Svezia ¹¹	—	SEK 4.931 per paziente ¹²
Paesi Bassi	—	€ 300 per paziente ¹³
Regno Unito	—	£ 889M (£ 171 per paziente) ¹⁴



Cause della perdita di produttività per i pazienti con rinite allergica



► In Italy, at present, there is no System of immediate and active prevention!! ◀



**AIS LIFE:
Sistema
d'Informazione
Integrata!!!**



Obiettivi:

1. Sviluppo del Sistema d'Informazione Integrata
2. Sistema di educazione – informazione
3. Aumento della consapevolezza del paziente
4. Immediata e attiva prevenzione verso le pollinosi
5. Efficace riduzione costi diretti e indiretti
6. Miglioramento della gestione delle malattie respiratorie

Soluzione:



**AIS LIFE
Aerobiological Information
Systems and allergic
respiratory disease
management**



AIS is a research project
co-financed by the
European Commission
within the LIFE+ Program



My idea: AirPOLL - IIS

Dati aerobiologici



Previsioni del tempo



AirPOLL - IIS
(Sistema d'Informazione Integrata)

Dati chimici

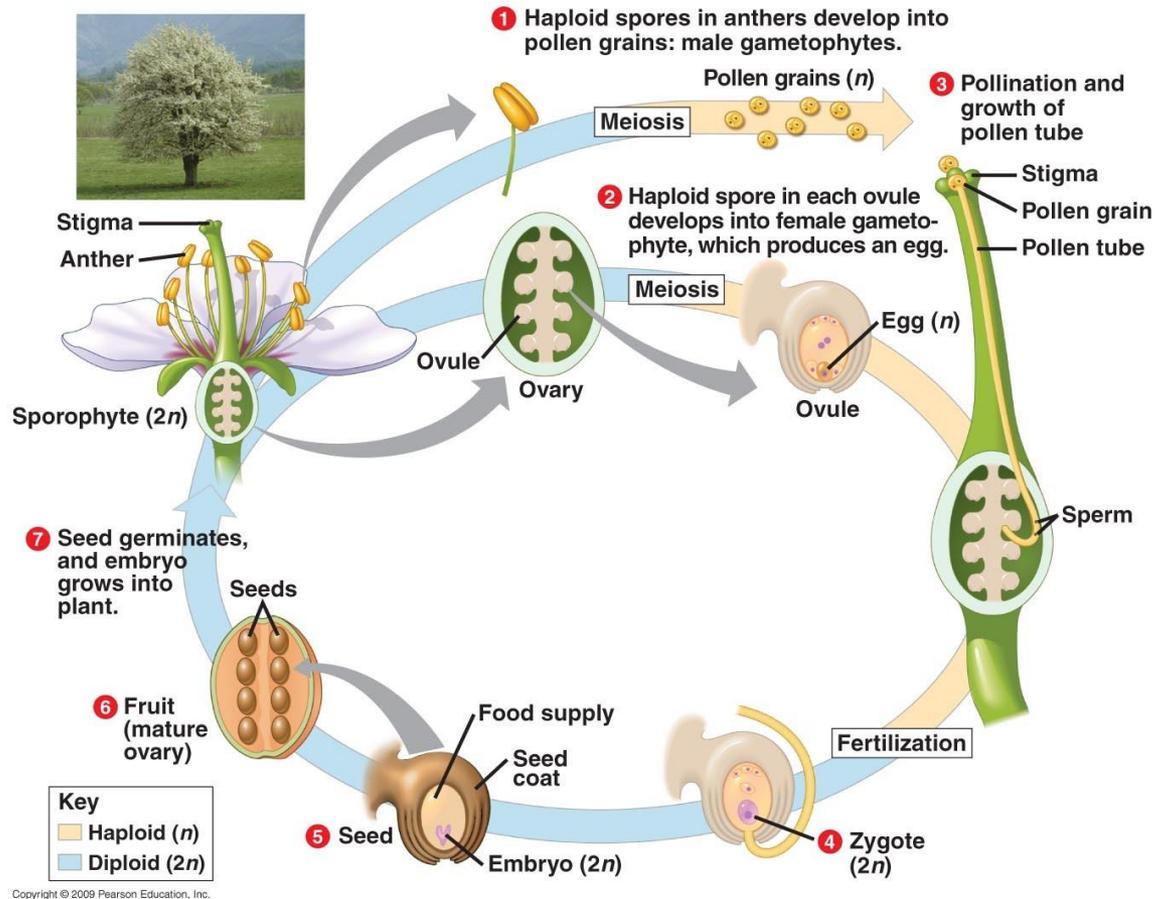


Commenti
multidisciplinari
aggiornati



Aumento della percezione del rischio con immediata prevenzione e miglioramento dello stato di salute del paziente pollinosico

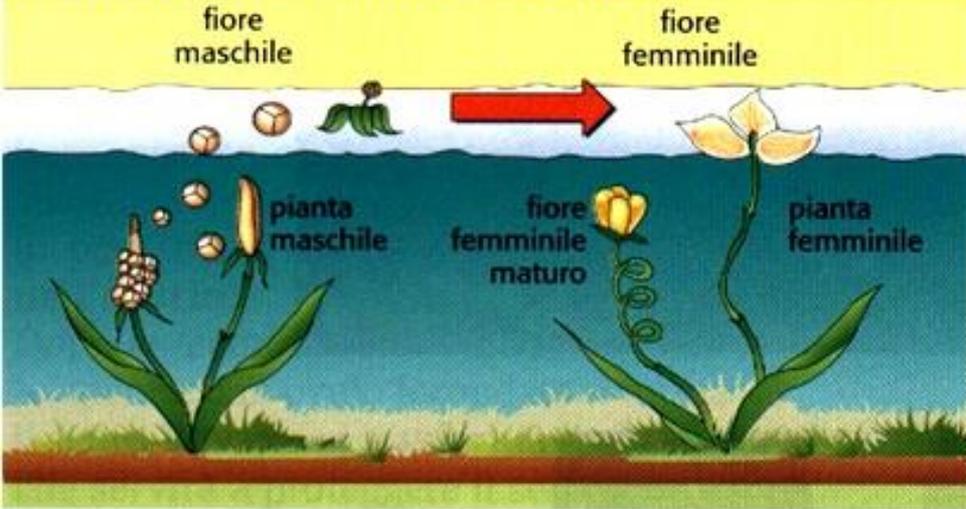
What is pollen?



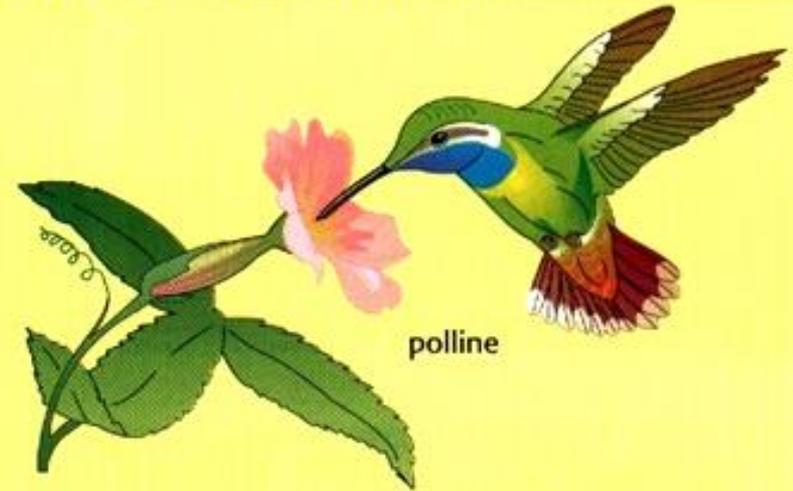
- Male gametophyte with function to fertilize ovule of the same species

Types of Pollination:

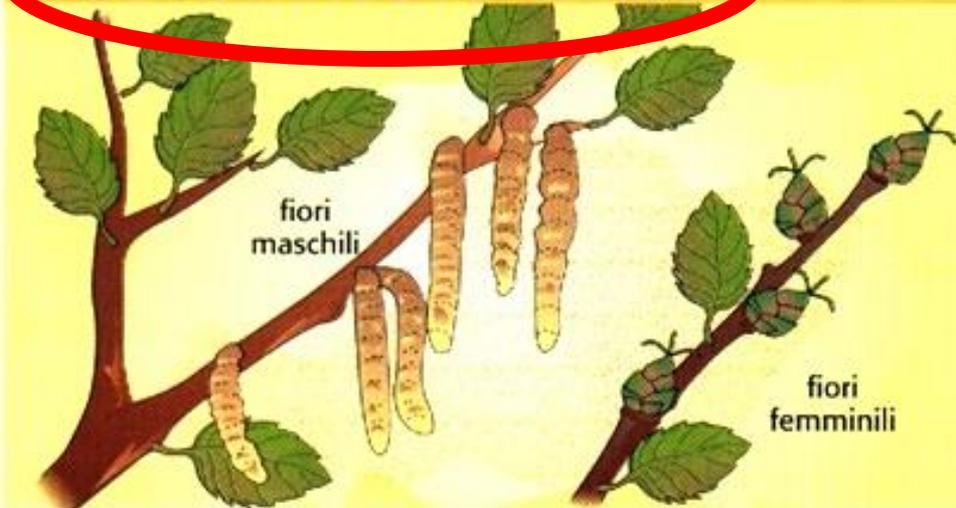
IDROFILA: ad opera dell'acqua



ZOOFILA: ad opera di animali



ANEMOFILA: ad opera del vento



ENTOMOFILA: ad opera di insetti



Dispersion pollen:

1. **Distribution and density of plants with anemophilous dispersion on area monitorated**
2. **Weather conditions**
3. **Pollen: Size and shape**
 - Urticaceae's pollen size: $\sim 15 \mu\text{m}$
 - Pinaceae's pollen size: $\sim 200 \mu\text{m}$



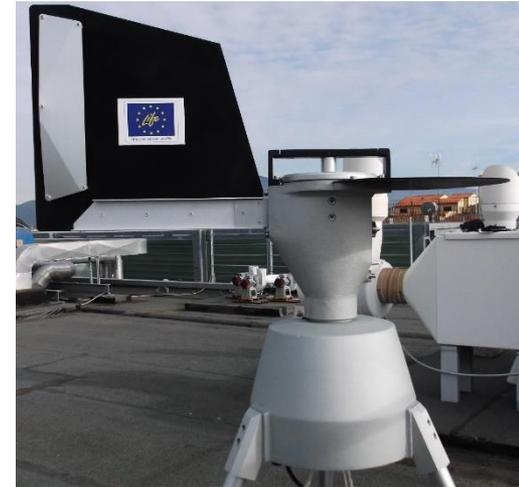
Pollen of *Pinus* spp.



Catturatore pollinico – Pollen trap



1. VPPS 2000 (Lanzoni)
2. Protocol: UNI 11108:2004
3. Pollen traps installed at 15 -20 m from ground level
4. Continuous sampling: 24 hours/day and seven days/week
5. Operative range: 10 Km



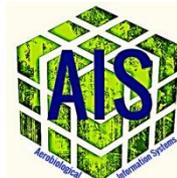
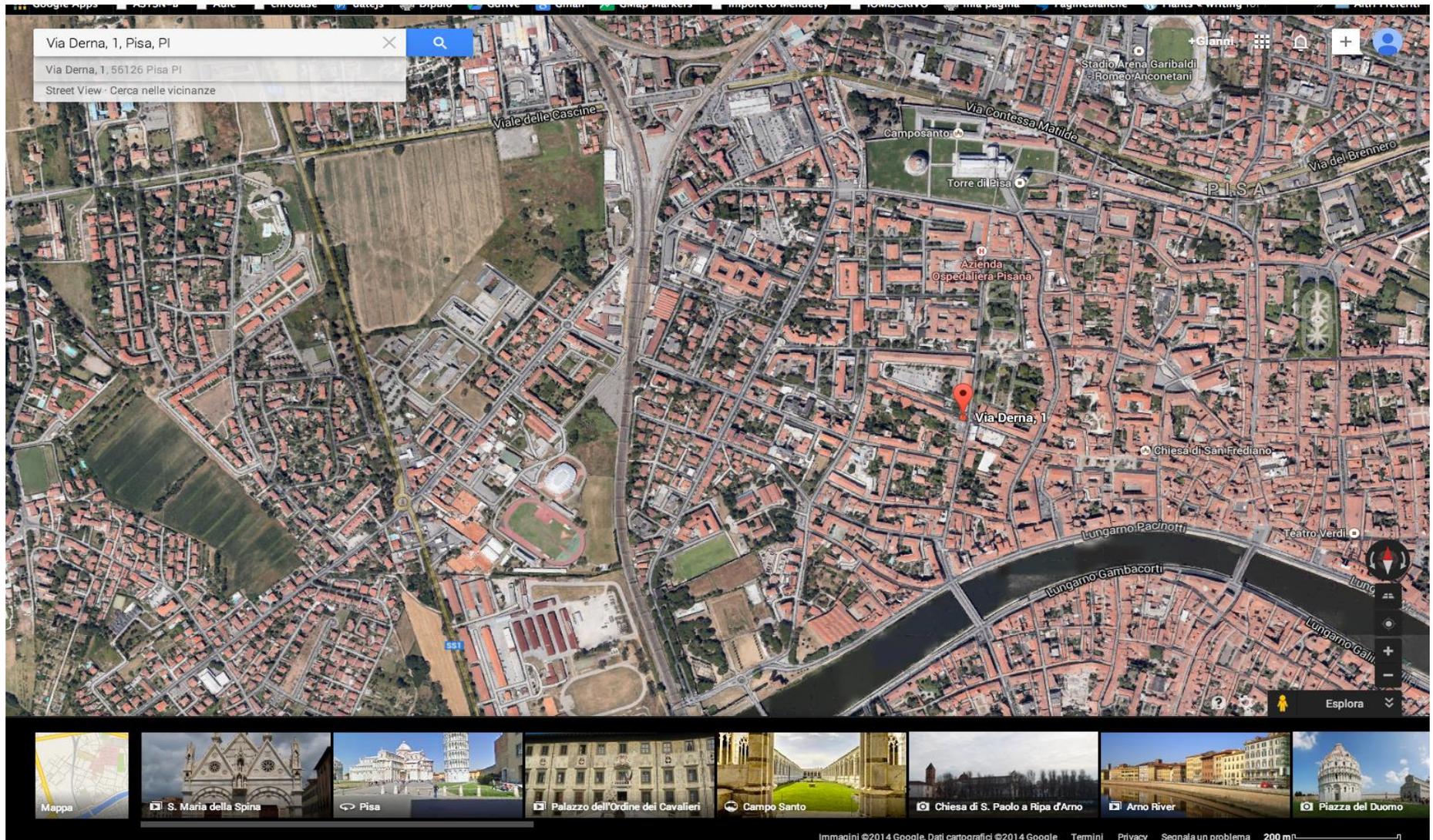
Botanic families:

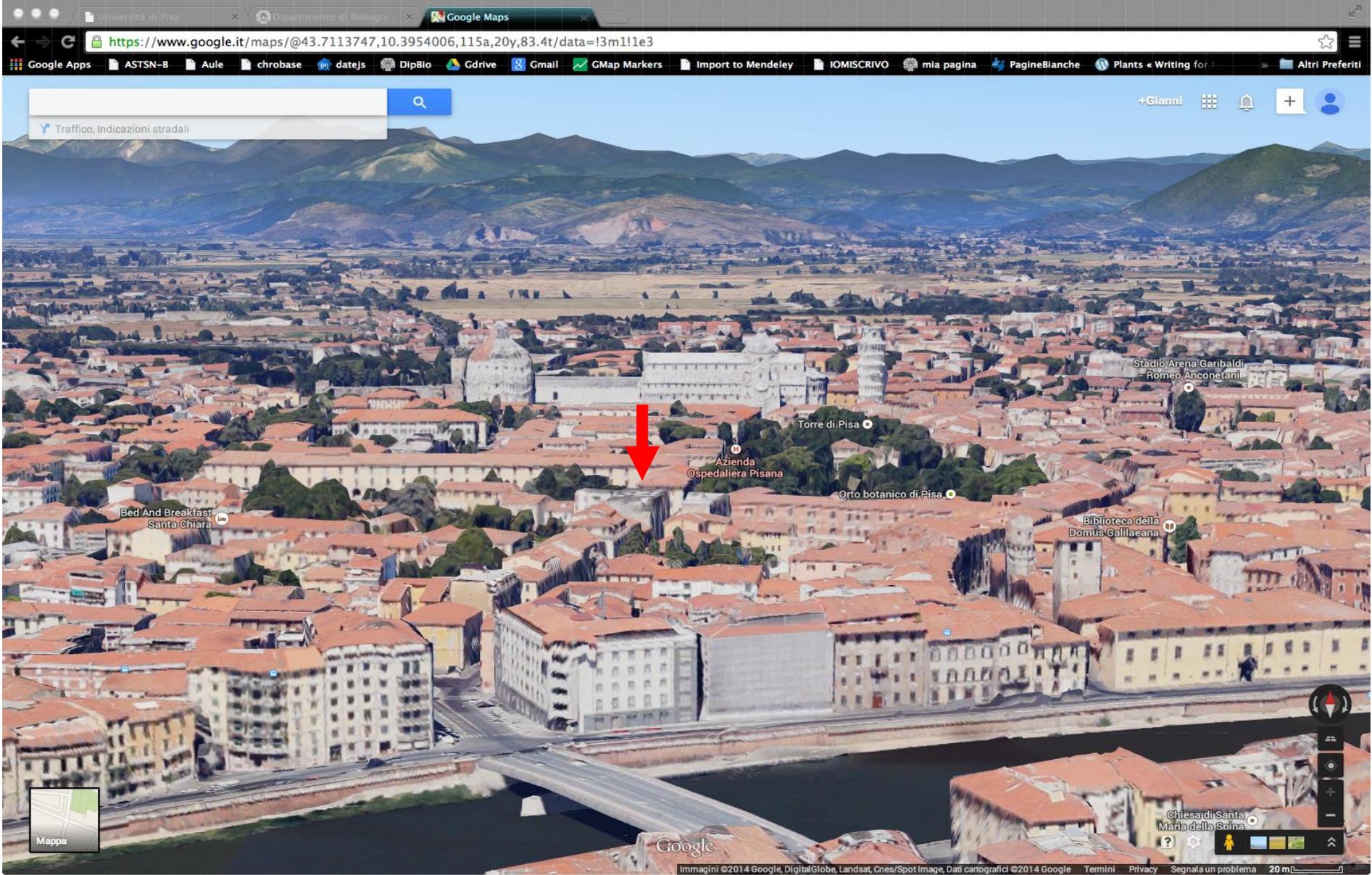
1. Betulaceae
2. Fagaceae
3. Oleaceae
4. Poaceae
5. Asteraceae
6. Urticaceae
7. Cupressaceae – Taxaceae
8. Platanaceae
9. Fungal spore: *Alternaria* spp

Start aerobiological monitoring:

- 4 November 2014 until now....
- Production of over 900 daily aerobiological samples

Equipment installation: location

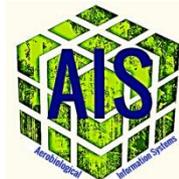




Equipment installation: location



Flat roof, with wireframe railing. The building is managed by the Department of Biology. Access to roof is easy but allowed to authorized staff only and the building is guarded. Both pollen trap and weather station have been installed.



Equipment installation: weather station

Davis Vantage Pro2 weather station



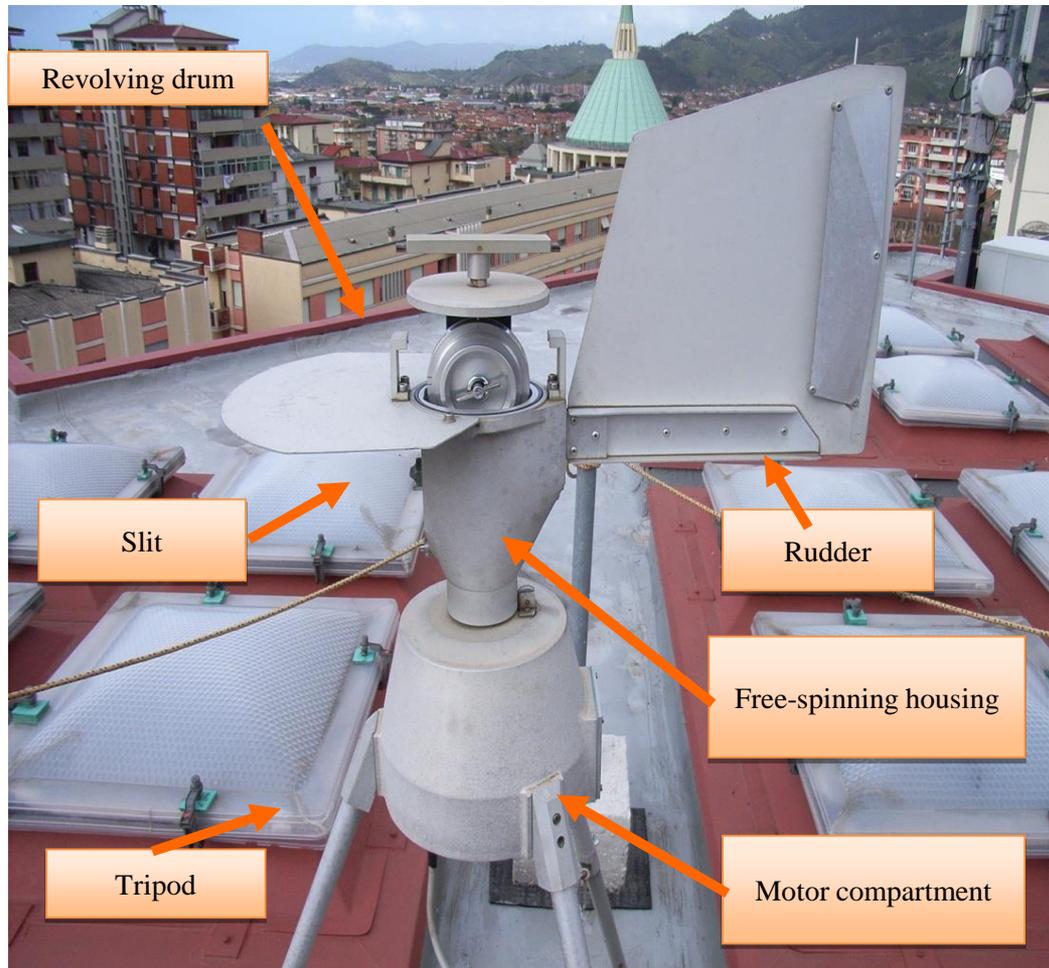
- Temperature
- Wind (speed and direction)
- Relative humidity
- Rainfall
- Atmospheric pressure
- Solar radiation

Data is stored in an internal temporary memory and then sent to a server via wireless connection for permanent storage.

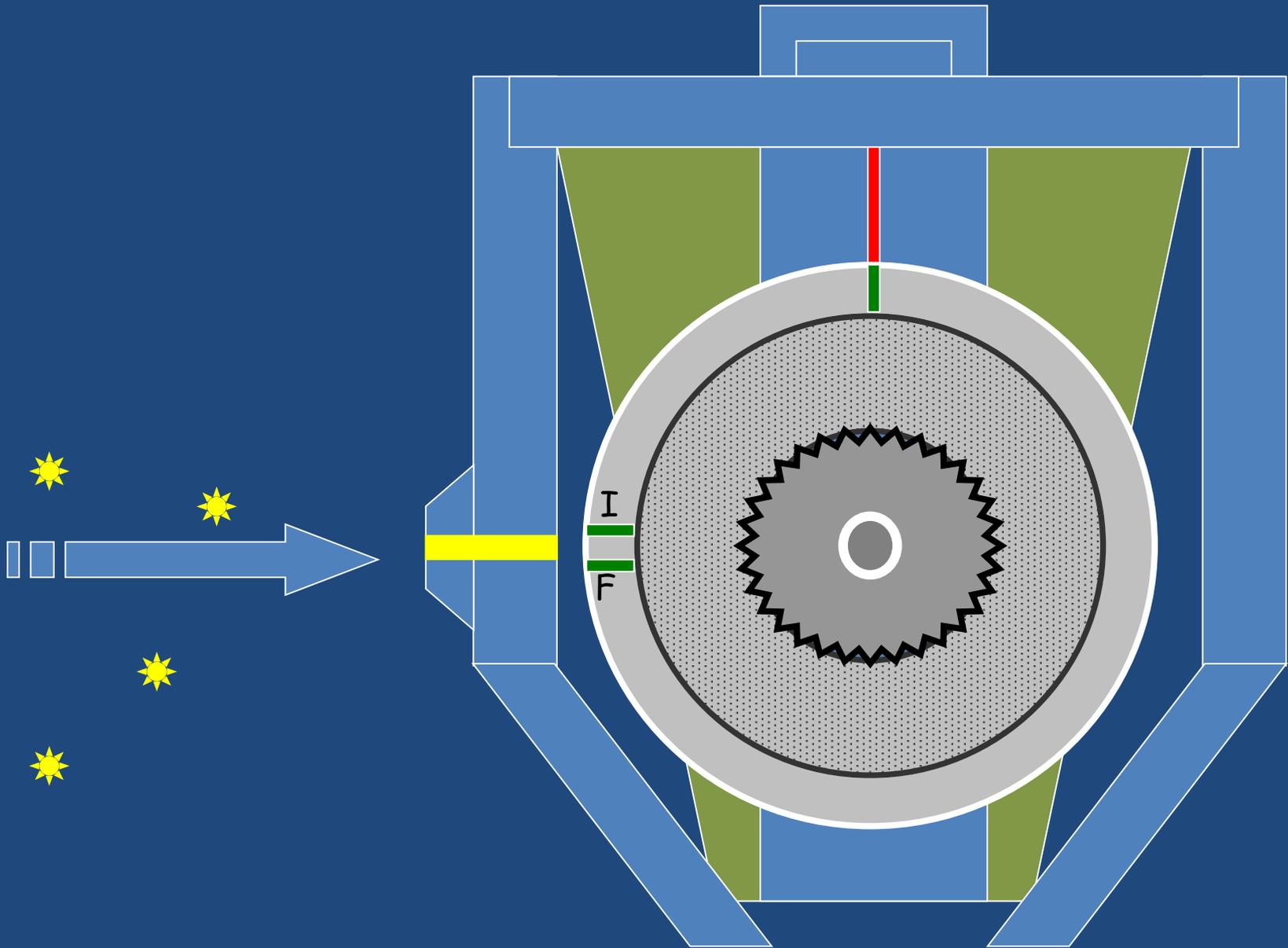
Data are sampled every 5 minutes.



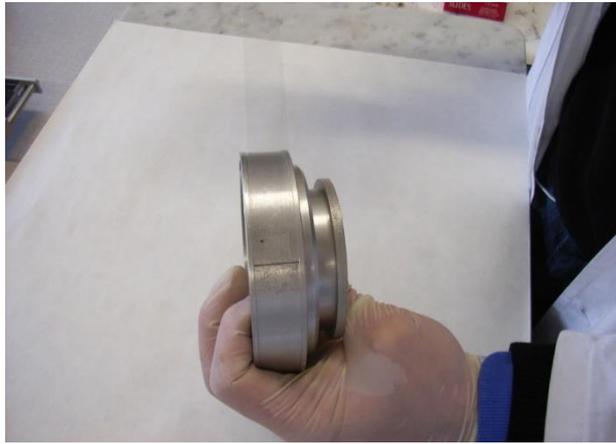
Data sampling: pollen grains and spores



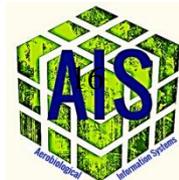
Suction pump ensures a constant air flow matching the respiratory flow, of 10 l/min (14,4 m³ in 24 h). The trap has a range of 10 km, allowing a full coverage of the urban area.



Data sampling: preparation of sampling film

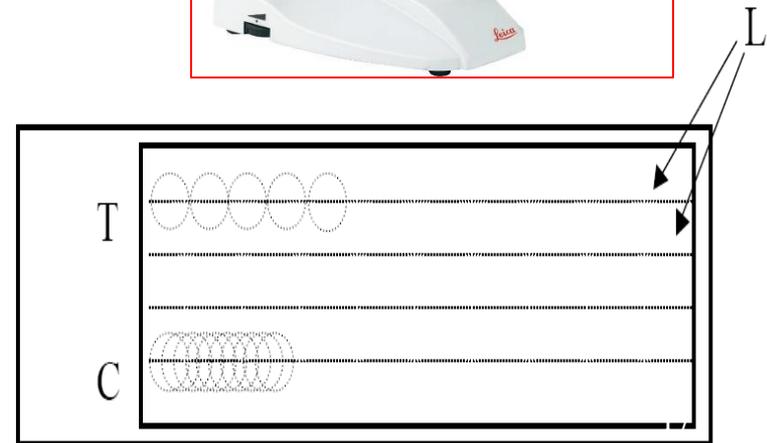
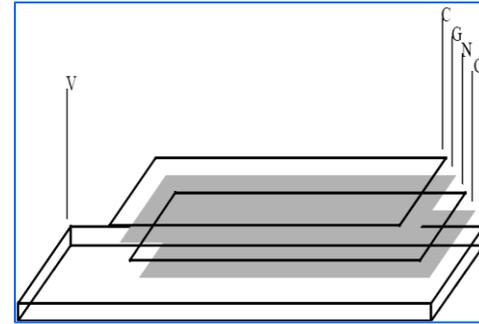


A 336 mm transparent Melinex® film strip is wound around a 107 mm diameter drum. The film is covered with a thin layer of 3% silicon fluid in carbon tetrachloride. The drum rotates by 2 mm/hr., allowing to sample without interruption up to 7 consecutive days without changing the sampling strip.

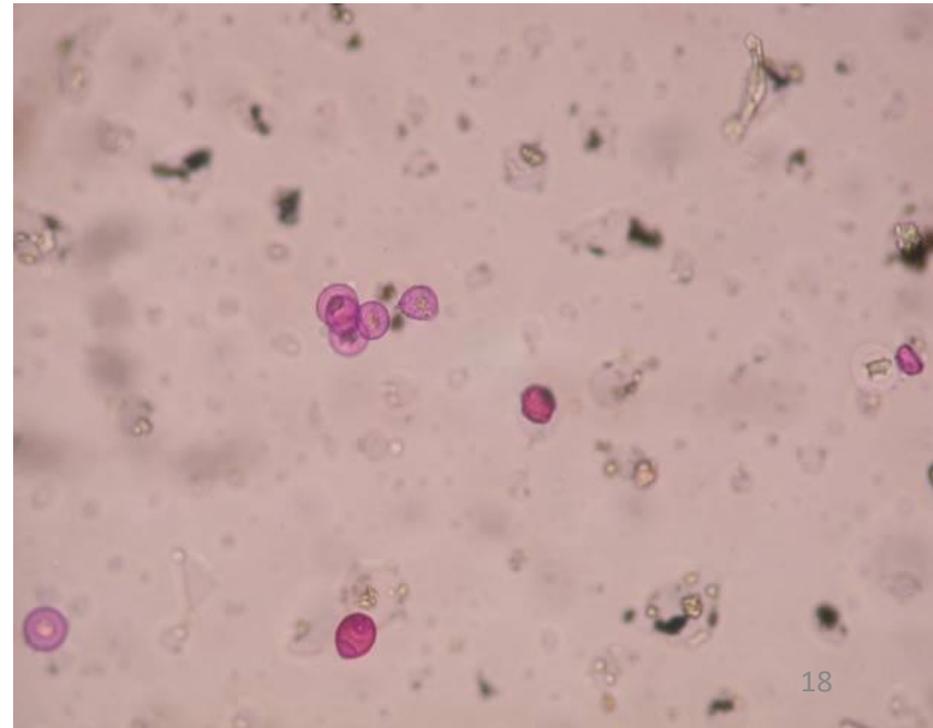
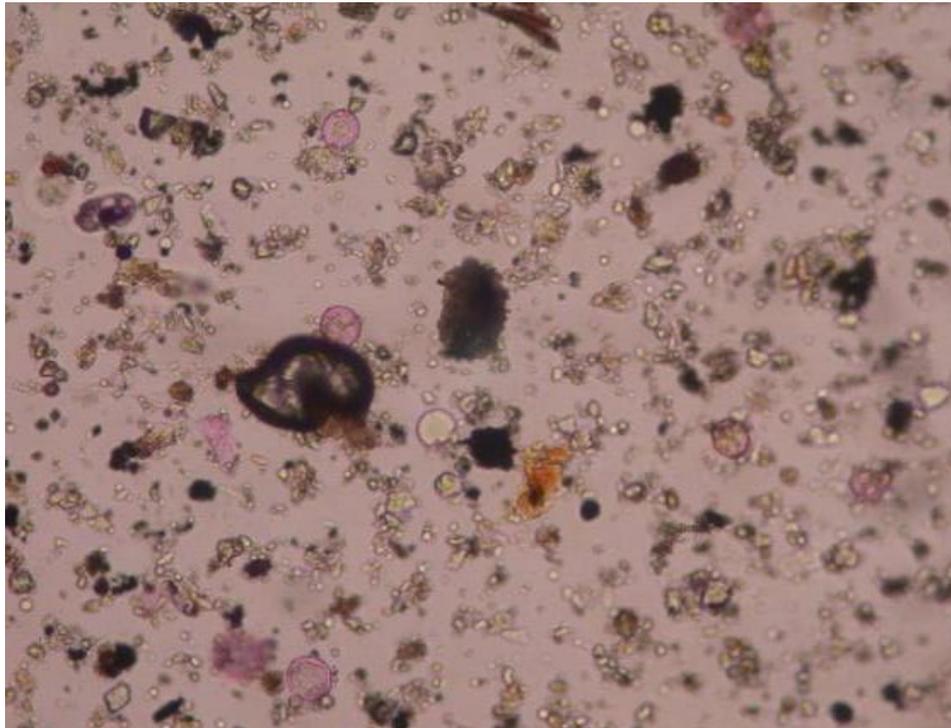
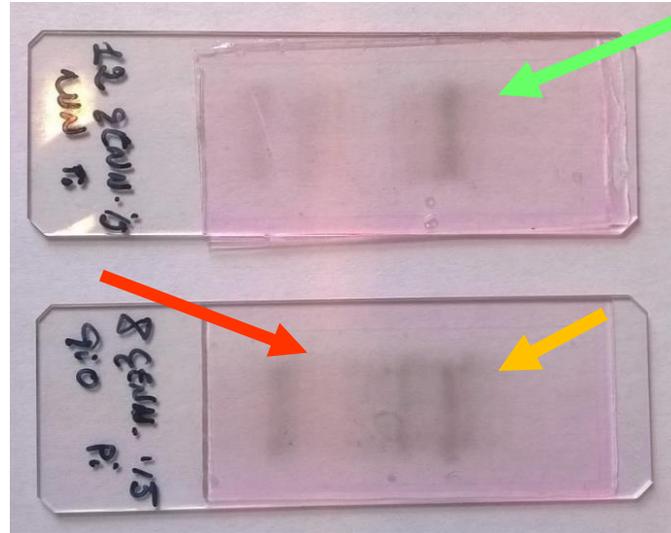


Principio del metodo - UNI 11108:2004

- **Campionamento:** il nastro trasportatore siliconato scorre alla velocità di 2 mm l'ora, per cui si ottengono segmenti giornalieri di 48 mm che vengono montati su vetrini.
- **Colorazione** con gelatina glicerinata con fucsina basica poi posti su piastra termostatica a 50 °C.
- **Conteggio dei granuli:**
 - è statistico
 - si osservano linee orizzontali per strisciata continua, distanti tra loro 2 mm, con ingrandimento 400X.
 - Il numero minimo di linee orizzontali deve corrispondere a circa il 18% della superficie campionata.
- **Trascrizione** su modulo di conteggio.

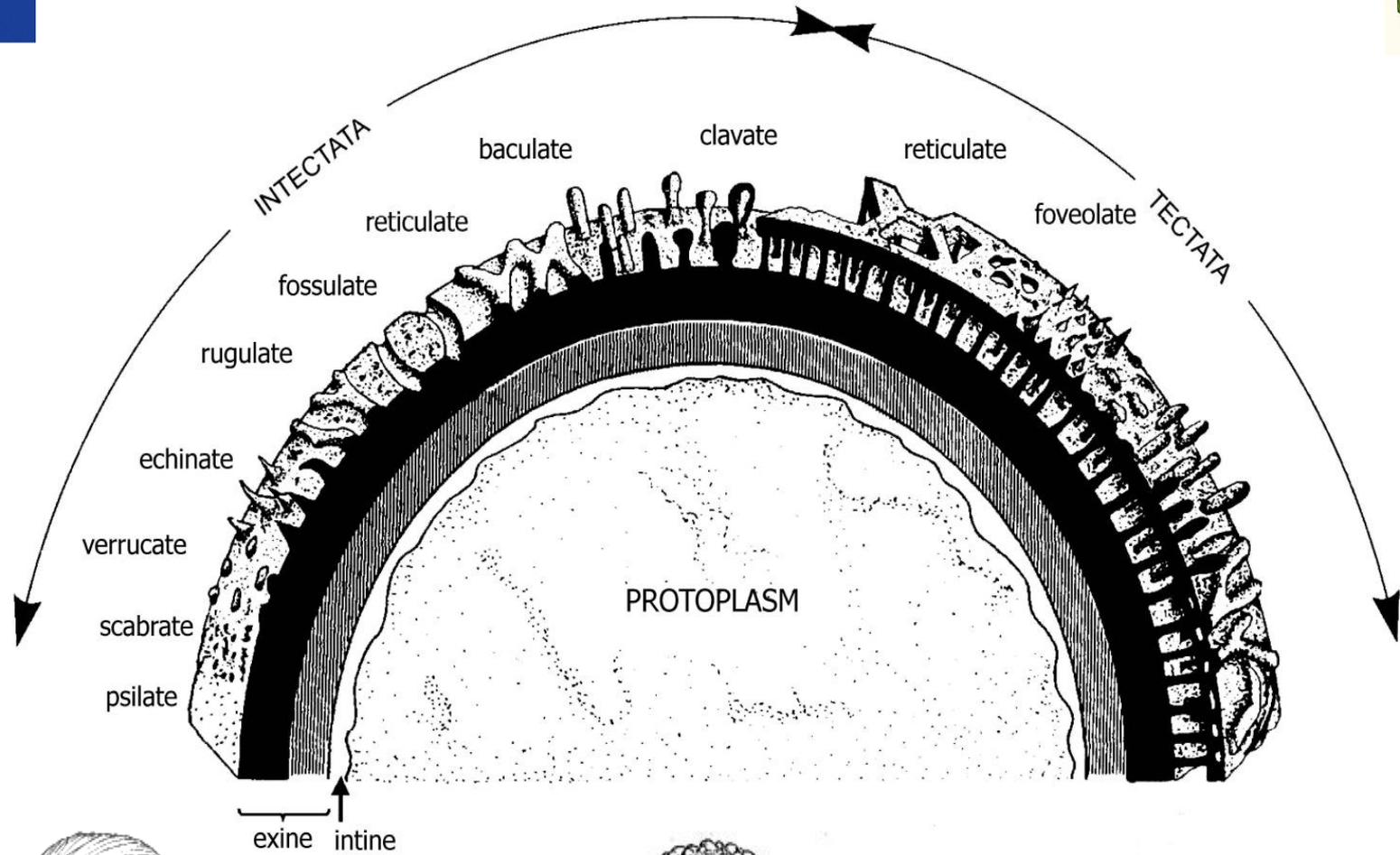


Data sampling: slides ready for analysis / storage

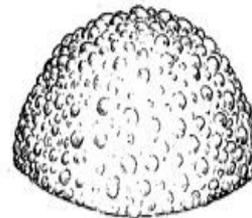




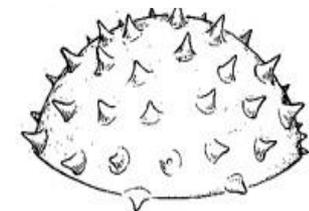
Pollen wall – sexinic ornamentations



• **Striate**
 es.: *Acer* spp.

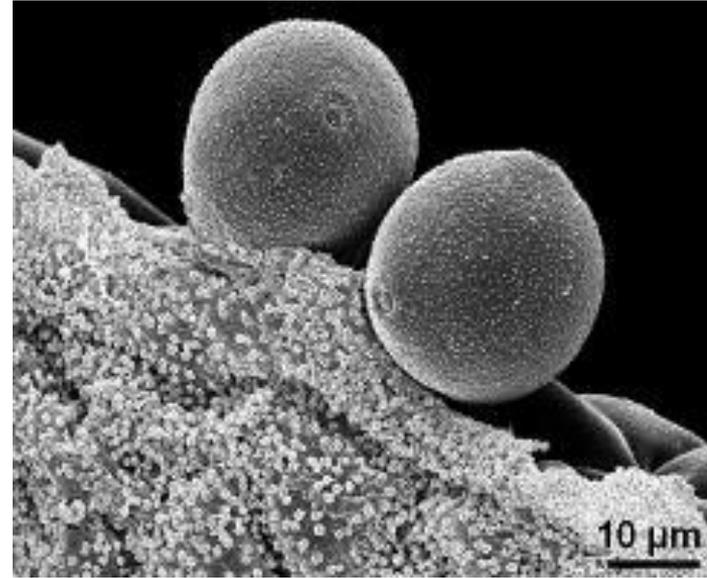
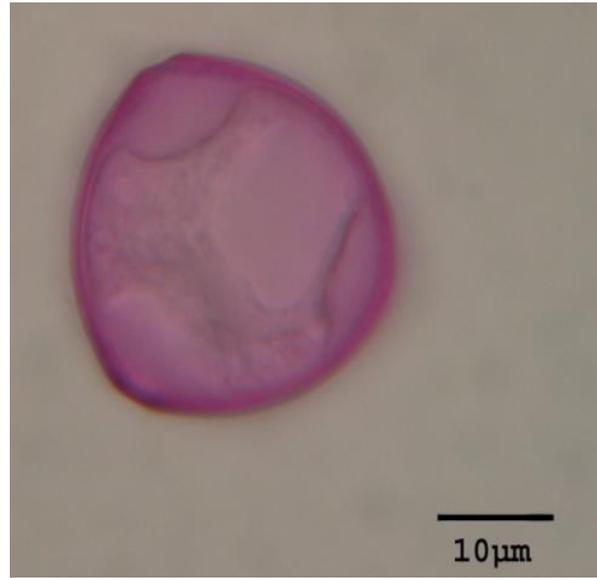


• **granulate**
 es.: *Quercus* spp.

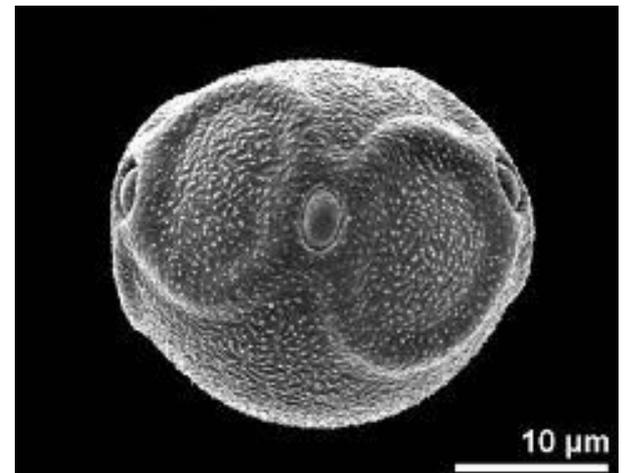


• **Echinate**
 es.: *Helianthus* spp.¹⁹

Some allergenic pollen grains:



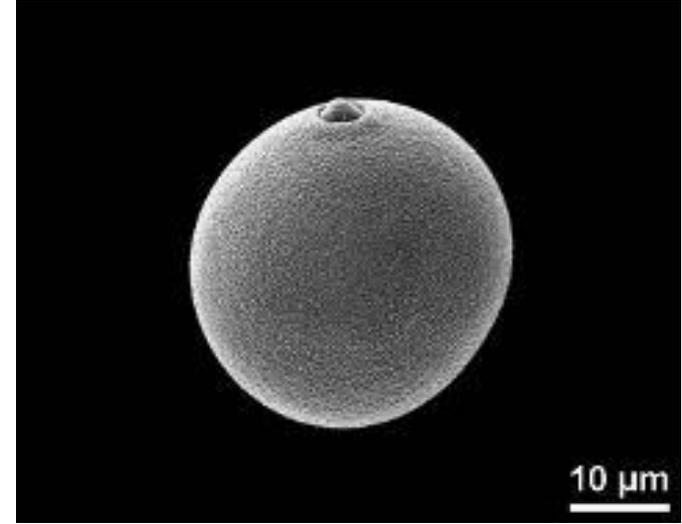
Inflorescence and pollen of *Corylus avellana* (nociolo)



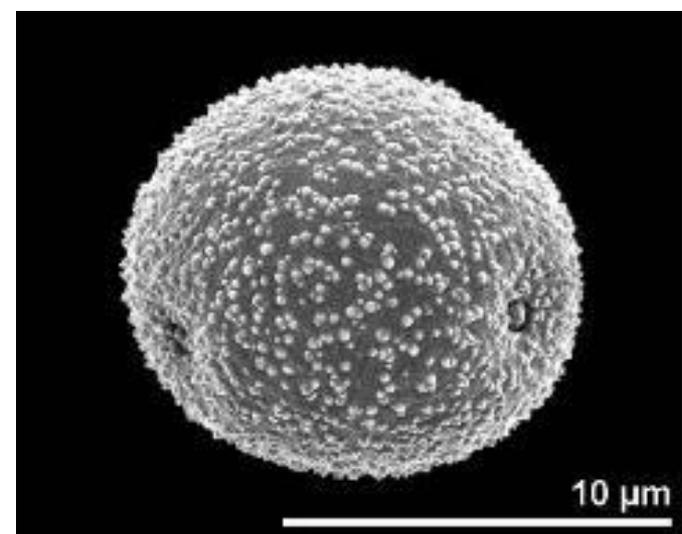
Inflorescence and pollen of *Alnus* spp. (ontano)



Alcune tipologie di infiorescenze e pollini allergizzanti



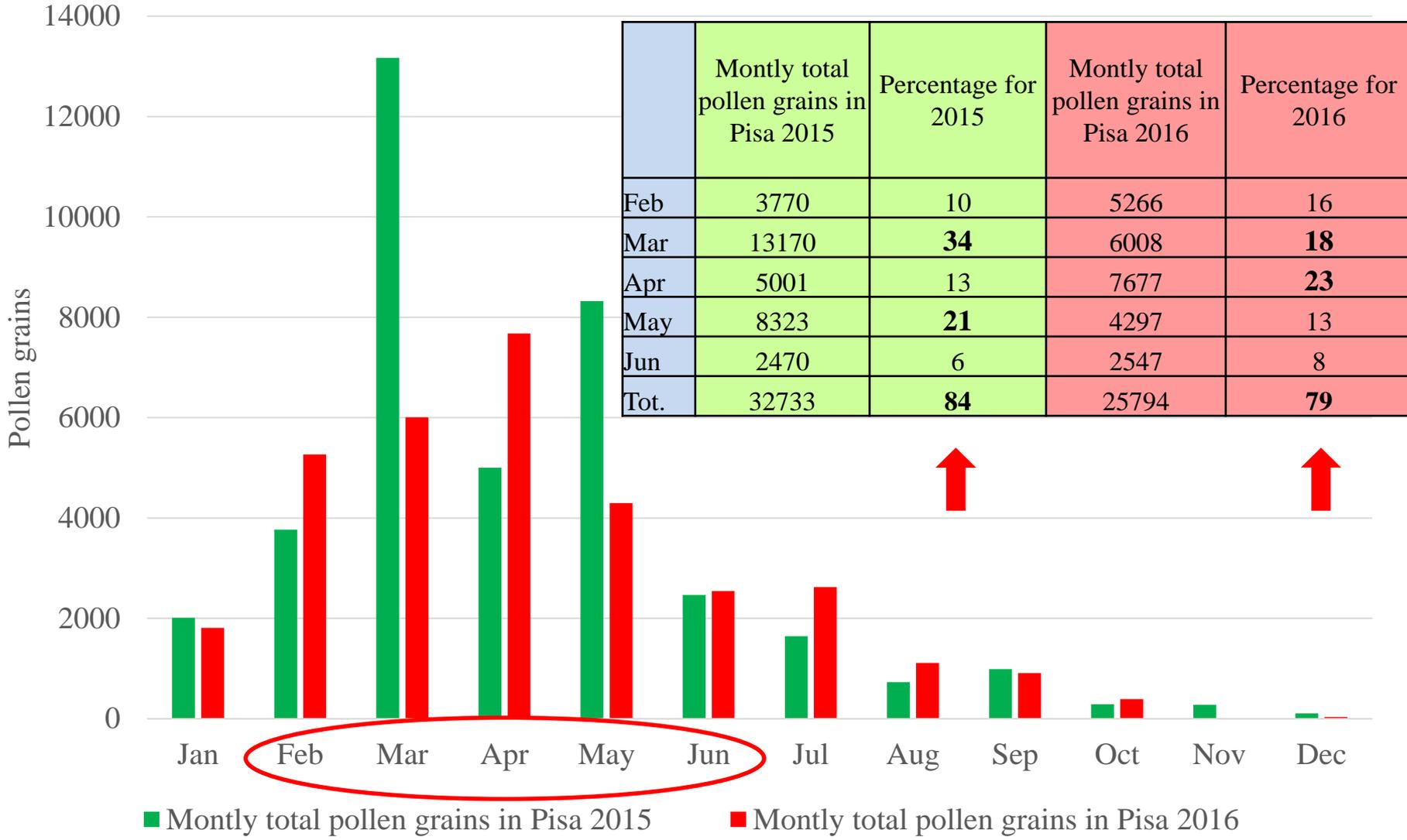
Inflorescence and pollen belonging to Poaceae



Inflorescence and pollen of *Parietaria* spp.



Aerobiological data: monthly total pollen grains

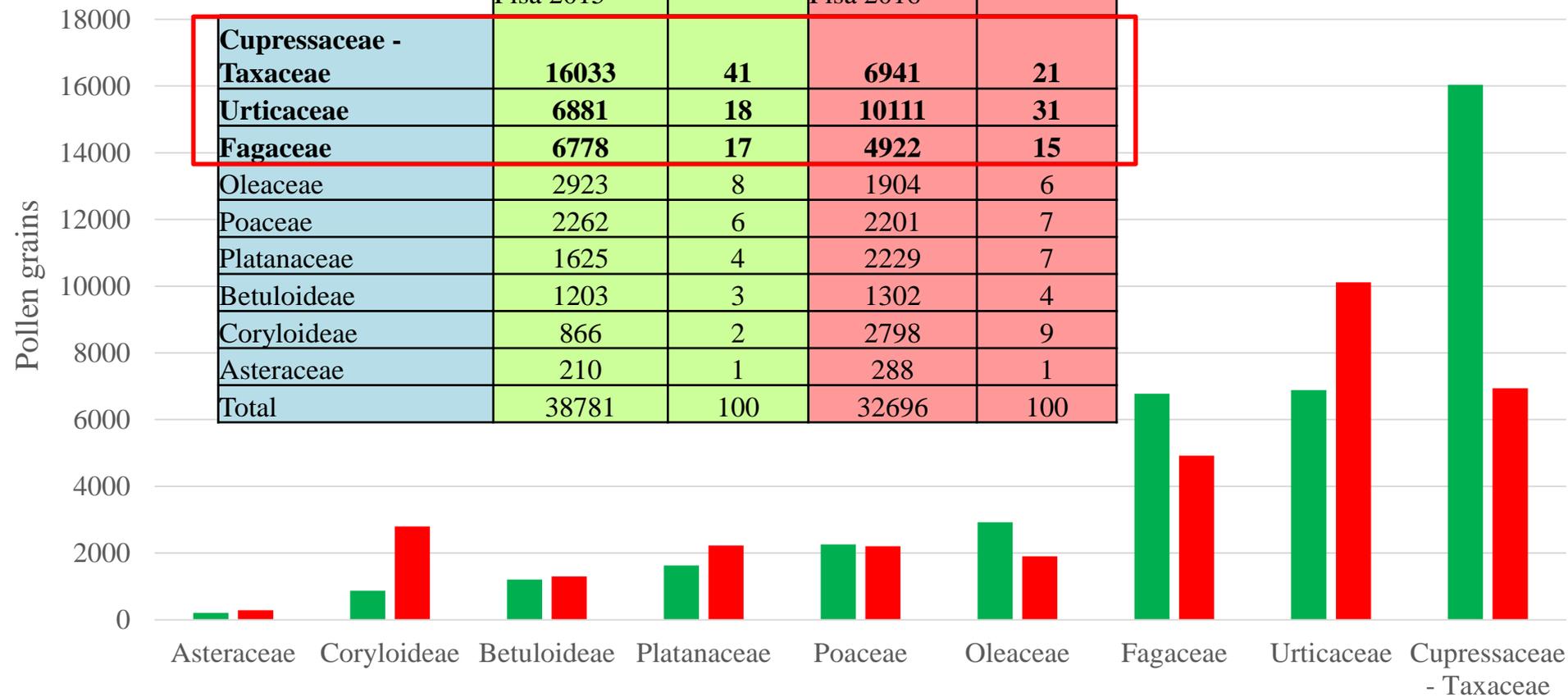




Aerobiological data: annual total pollen grains for family



	Annual total pollen grains for family in Pisa 2015	Percentage for 2015	Annual total pollen grains for family in Pisa 2016	Percentage for 2016
Cupressaceae - Taxaceae	16033	41	6941	21
Urticaceae	6881	18	10111	31
Fagaceae	6778	17	4922	15
Oleaceae	2923	8	1904	6
Poaceae	2262	6	2201	7
Platanaceae	1625	4	2229	7
Betuloideae	1203	3	1302	4
Coryloideae	866	2	2798	9
Asteraceae	210	1	288	1
Total	38781	100	32696	100

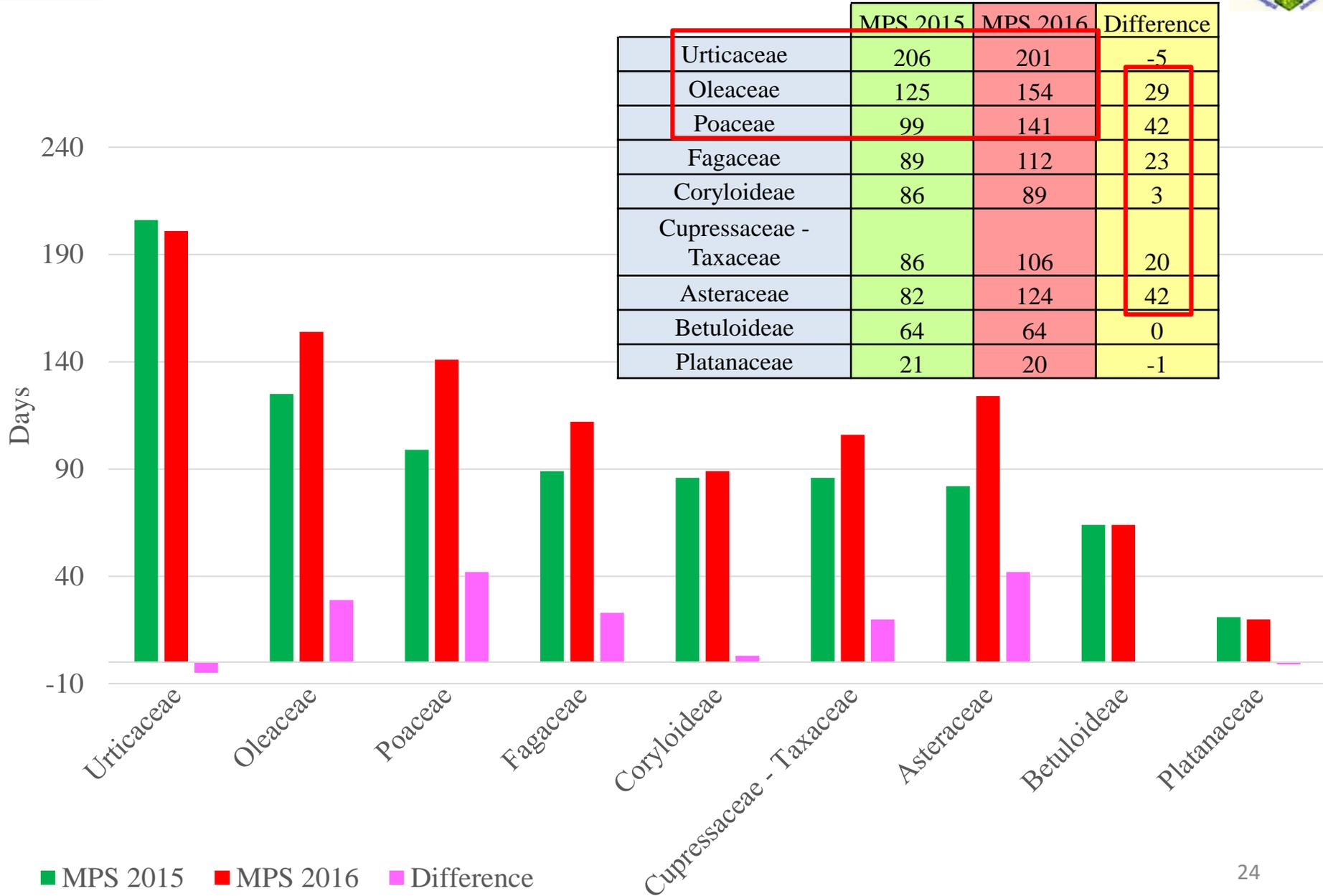


■ Annual total pollen grains for family in Pisa 2015

■ Annual total pollen grains for family in Pisa 2016



Aerobiological data: Main Pollen Seasons

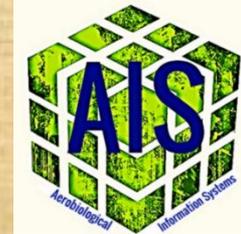




AIS LIFE Project

Thank you very much for your cooperation!!!

***Francesca, Sandra, Marija, Isabella,
Sara, Michel, Samuel,
Simone, Lorenzo, Amir, Uwe, Gianni***



Aerobiological Information Systems and allergic respiratory disease management AIS LIFE

(AIS LIFE LIFE13 ENV/IT/001107)

<http://www.ais-life.eu/>

- **Dr. Franco Ruggiero**

University of Pisa

Department of Biology

e-mail:

franco.ruggiero@for.unipi.it

- **Prof. Gianni Bedini**

University of Pisa

Department of Biology

e-mail: gianni.bedini@unipi.it