Curation and Management of Natural Sciences Collections

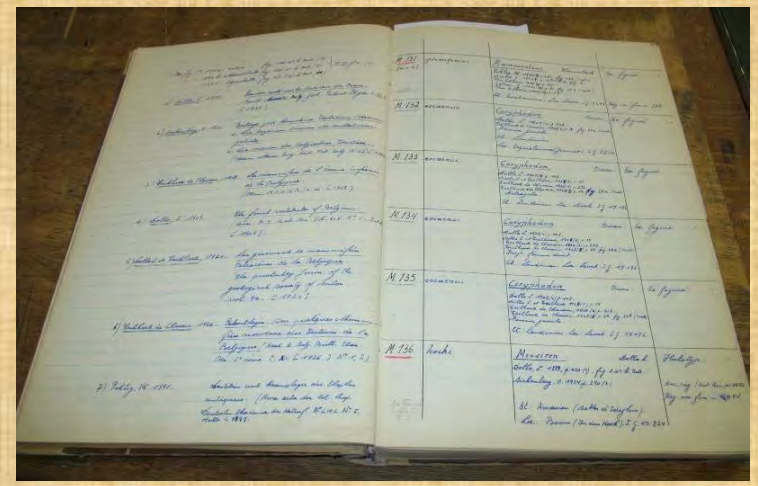
Online workshop on Conservation and Digitization

25th February 2021

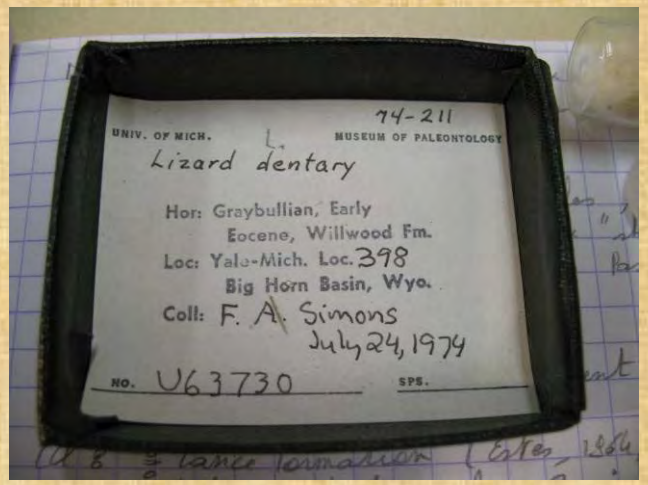
museum

Dr. Annelise Folie
Curator of Paleontological Collections
annelise.folie@naturalsciences.be

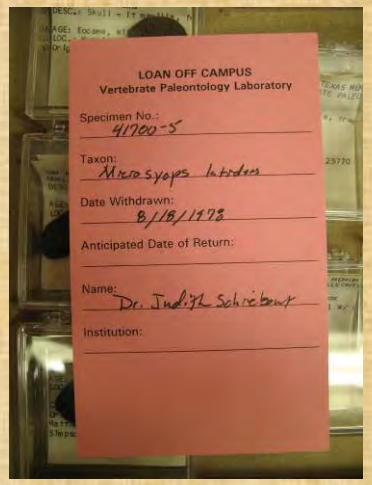
ArcHIVE Project



RBINS, Brussels



Univ. of Michigan, USA



Univ. of Texas, USA

Chapter 0: Why this course ?

tasks of the collection managers/curators = preserve collections

-> keep a critical eye to observe, evaluate and identify potential problems

-> get experience, training, ...

We will here:
- look at the environmental factors linked to the collections
- how to modify them for improvements

Chapter 1: Goals of natural sciences collections

- **Exhibiting** objects: permanent or temporary exhibitions
- Propose collections for **scientific research**
- Through **educational work** (guided tours, workshops, etc.)

Qualified staff !!!

Chapter 2: Why to build collections ?

Patrimonium

Richness of the nation

Culture

Past

Future

Chapter 3: Why to durably preserve collections ?

- Because the value of a collection is priceless !

Period, place, size, colour, author/discoverer
Artistic, cultural or historical value

Chapter 3: Why to durably preserve collections ?

- Because a collection is unique !

Reference value
(holotype, signed work,...)

Decline

=

Natural Process !

Chapter 4: How to durably preserve collections ?

~~Stop~~

Slow down

Chapter 4: How to durably preserve collections ?

Chaptre 4.1: Constitutive elements of collections

- Same material :

bone, calcium carbonate, rock, mineral, ...

Chapter 4: How to durably preserve collections ?

Chaptre 4.1: Constitutive elements of collections

- Same material :

bone, calcium carbonate, rock, mineral, ...

- Different materials :

naturalised animals, mounted skeleton, mineral assemblage, …

Chapter 4: How to durably preserve collections ?

Chaptre 4.1: Constitutive elements of collections

Chapter 4: How to durably preserve collections ?
Chaptre 4.1: Constitutive elements of collections

- organic matter :
    - decompose faster

- Not organic matter :
    - decompose more slowly

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human
2. Temperature
3. Relative Humidity
4. Light
5. Air quality
6. Mechanical forces
7. Water and Fire
8. Storage
9. moulds and pests

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human

Collect the objects
Handle them

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human

Preparation **Cleaning**

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human

Preparation **Cleaning** **Restauration** **Storage**

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human

2. Temperature

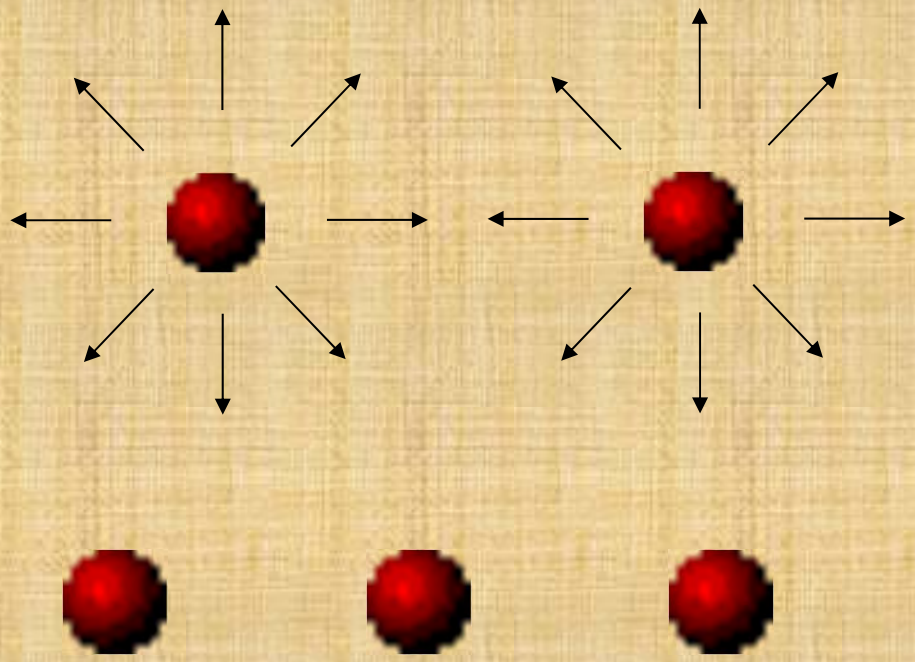
Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

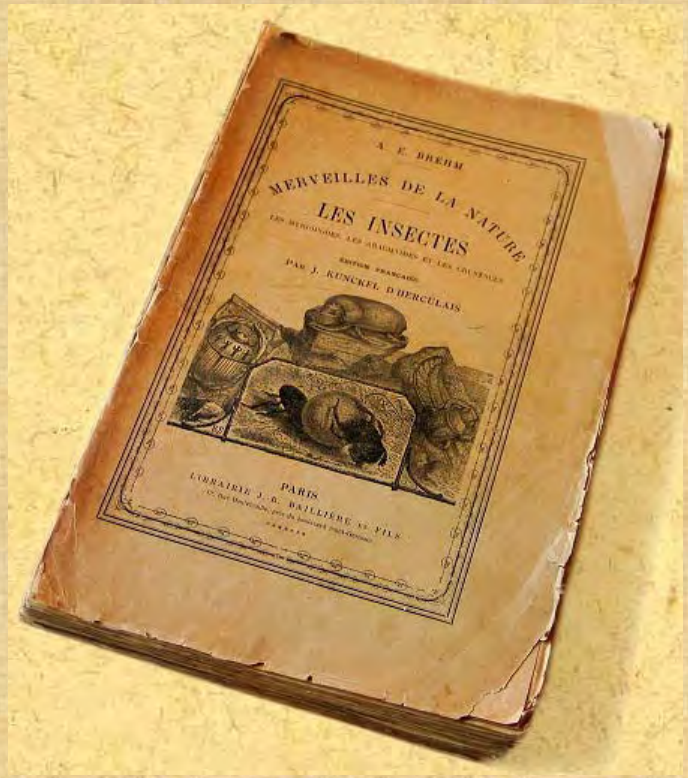
Temperature = measurement of the molecules movement in matter

T° ↗

T° ↘



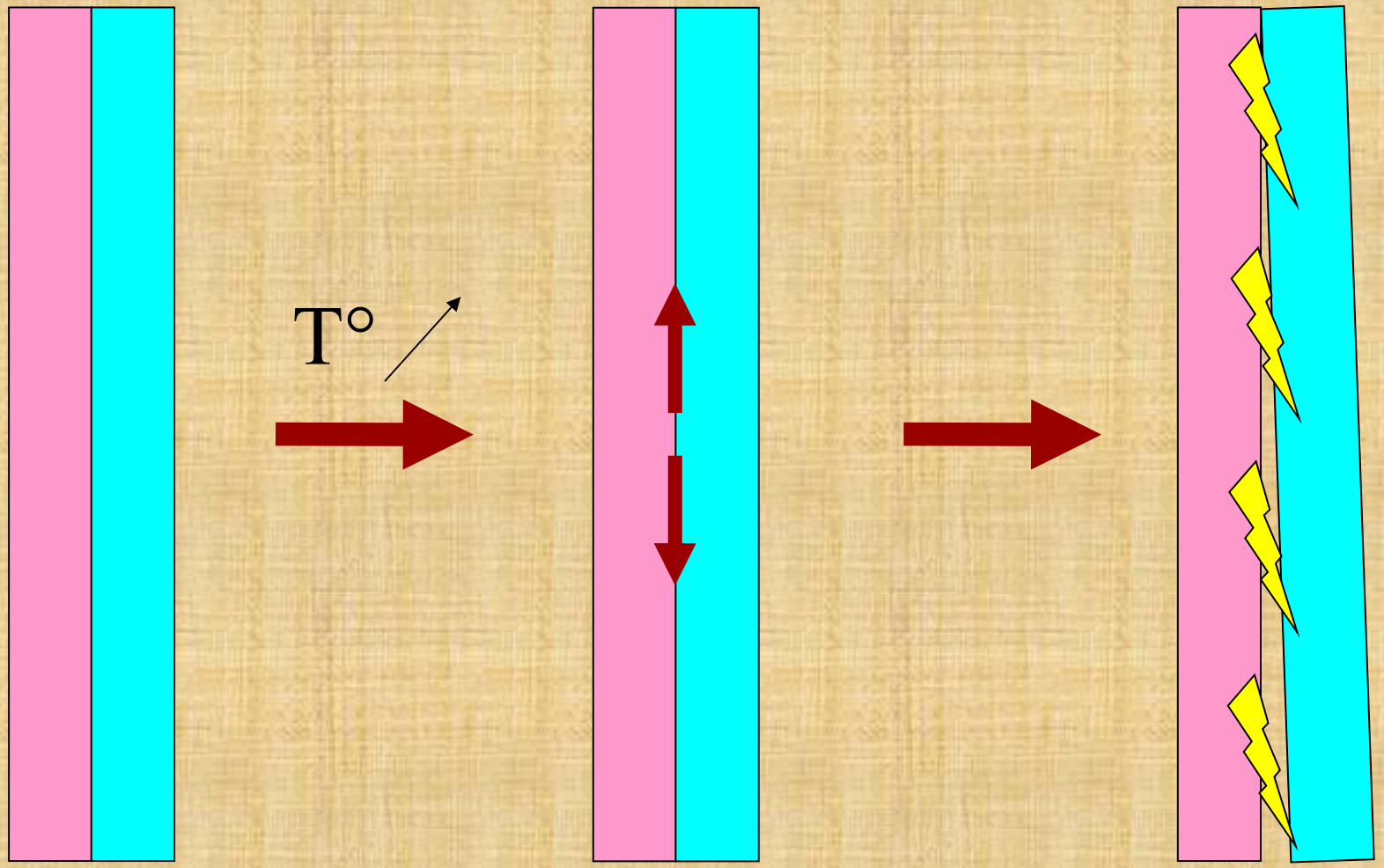
Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation



T°

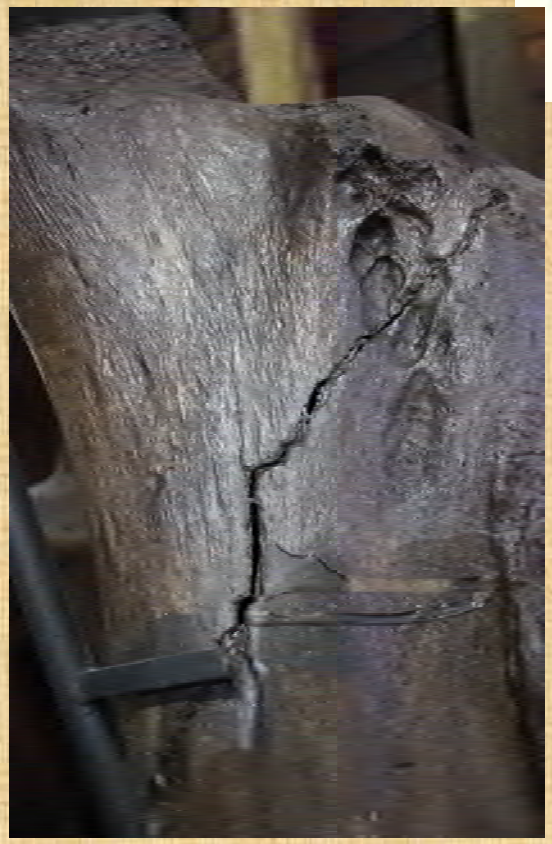
Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation



Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

T° ↗ + RH ↘

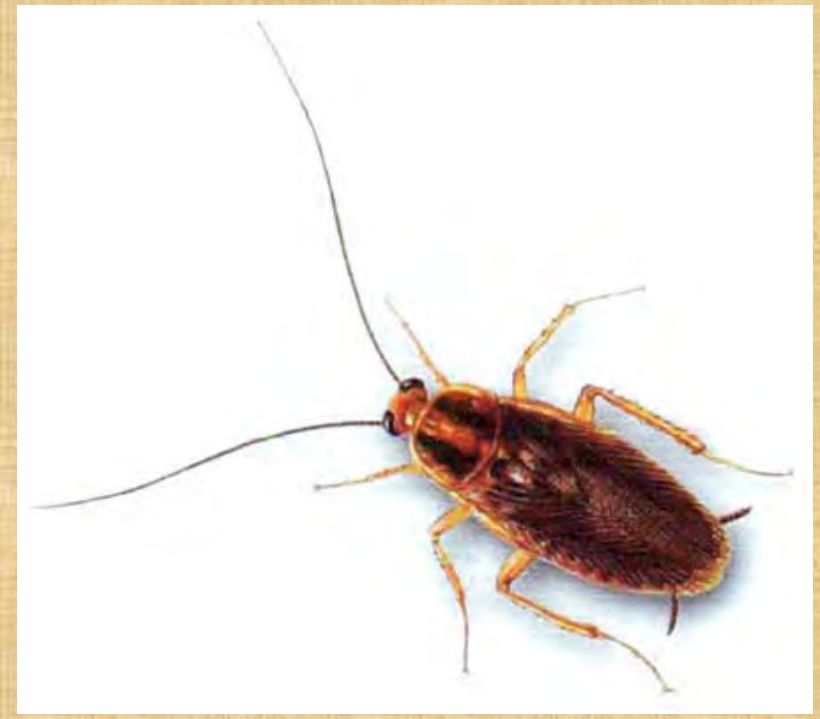


Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

T° ↗ + RH ↗

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

T° ↗ + RH ↗



Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

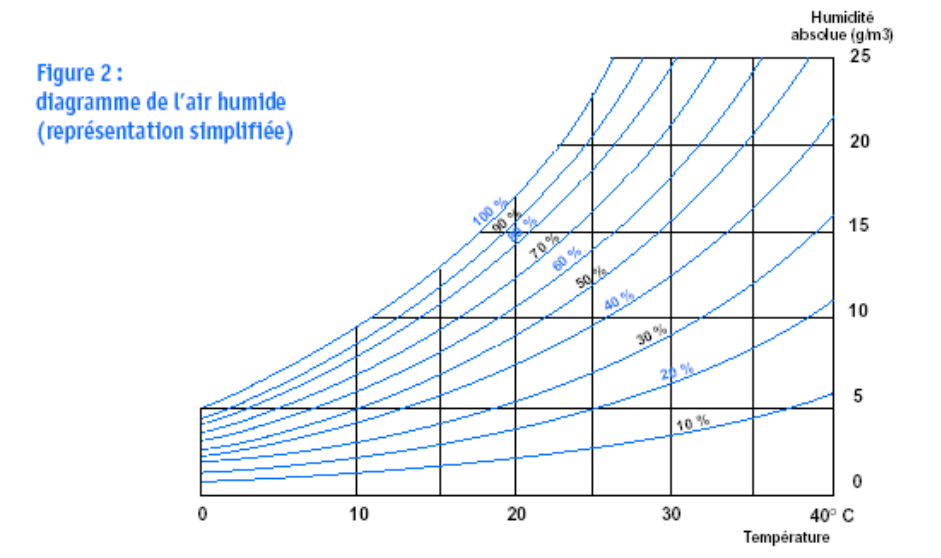
1. Human

2. Temperature

3. Relative Humidity

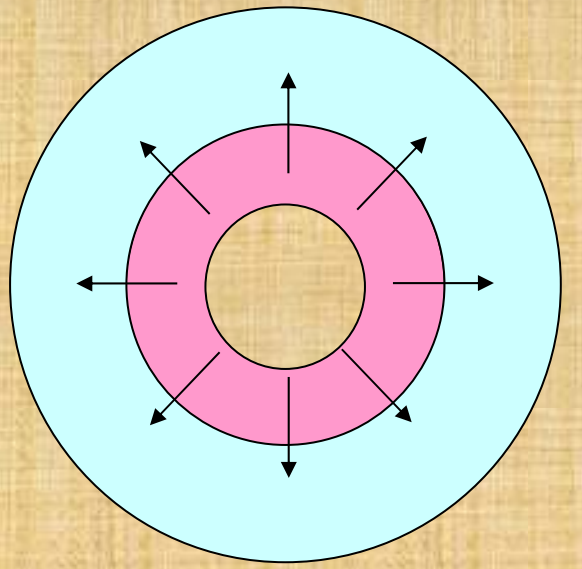
Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

Relative Humidity → **Quantity of water in the air with a certain temperature** / **Maximum quantity of water that air can contain at this temperature**



T° ↗ → **RH** ↘

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation



Internal tensions

Hygroscopy

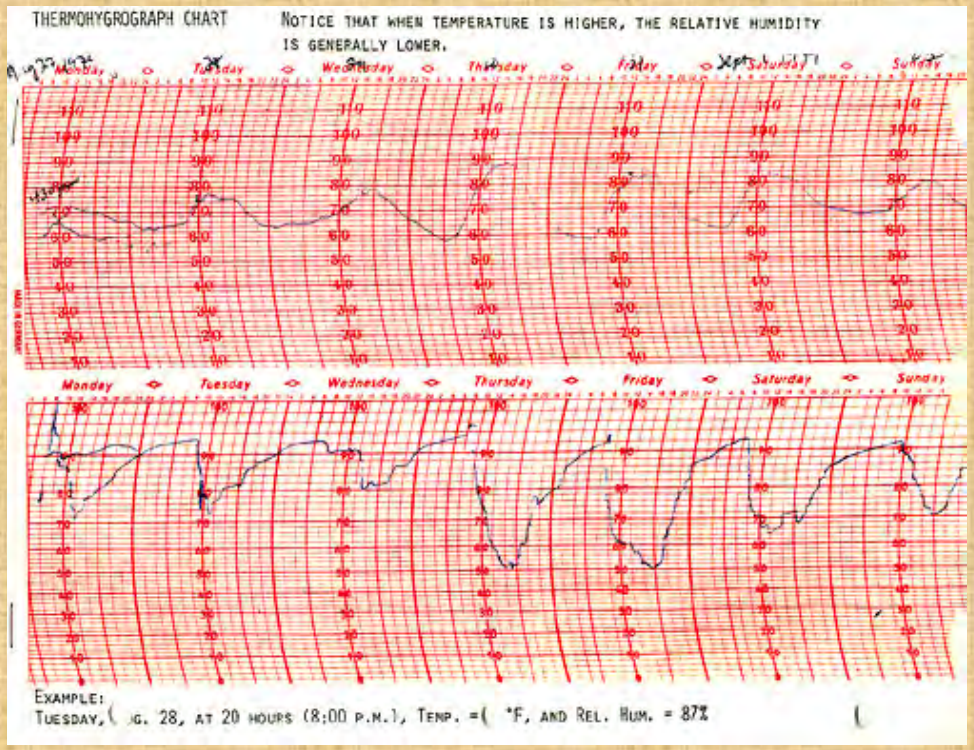
Rust

Devitrification

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

thermohygrograph

T°



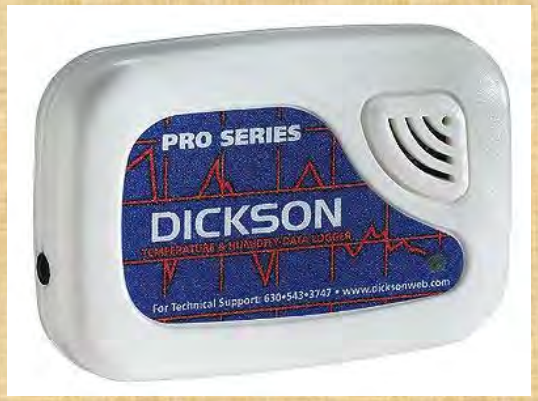
RH

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

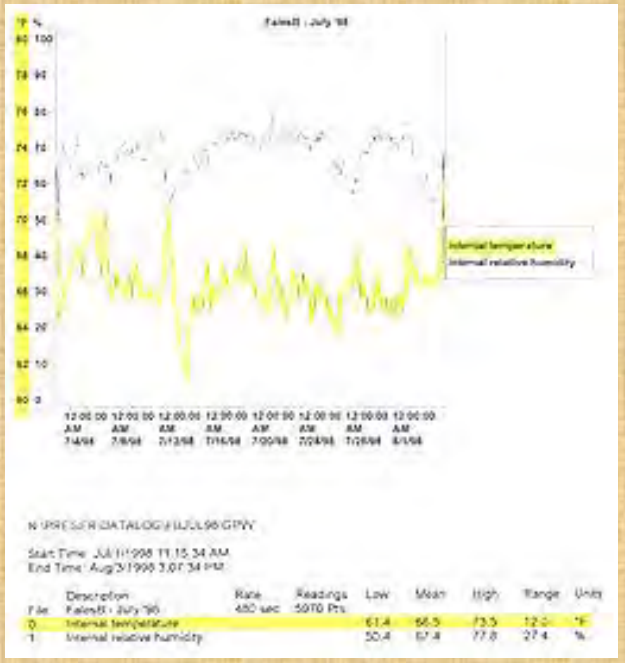
hair hygrometer

electronic thermohygrometer

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation



dataloggers



Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

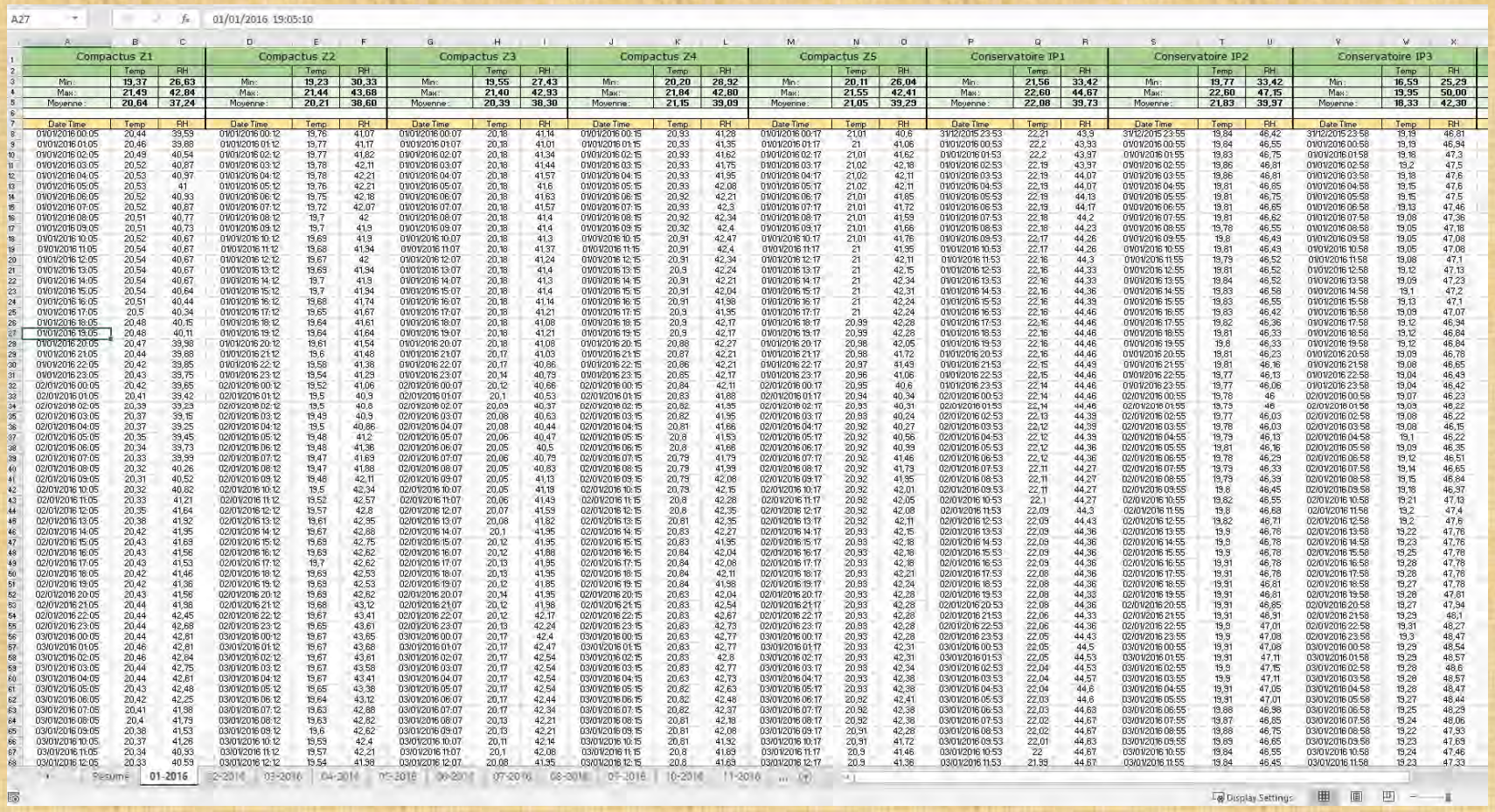
Important factors when purchasing data loggers :

- memory capacity
- frequency of observations (per second, minute or hour)
- number of information that can be recorded (T, RH, light...)
- battery life (must be at least 6 month, depending on the frequency of measurements)
- with or without display
- with or without audible/visual alarm
- software user-friendly
- size, external appearance

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

What can you do with the data/graphic ?

- Add data in registers or computer



A27 — 01/01/2016 19:05:10

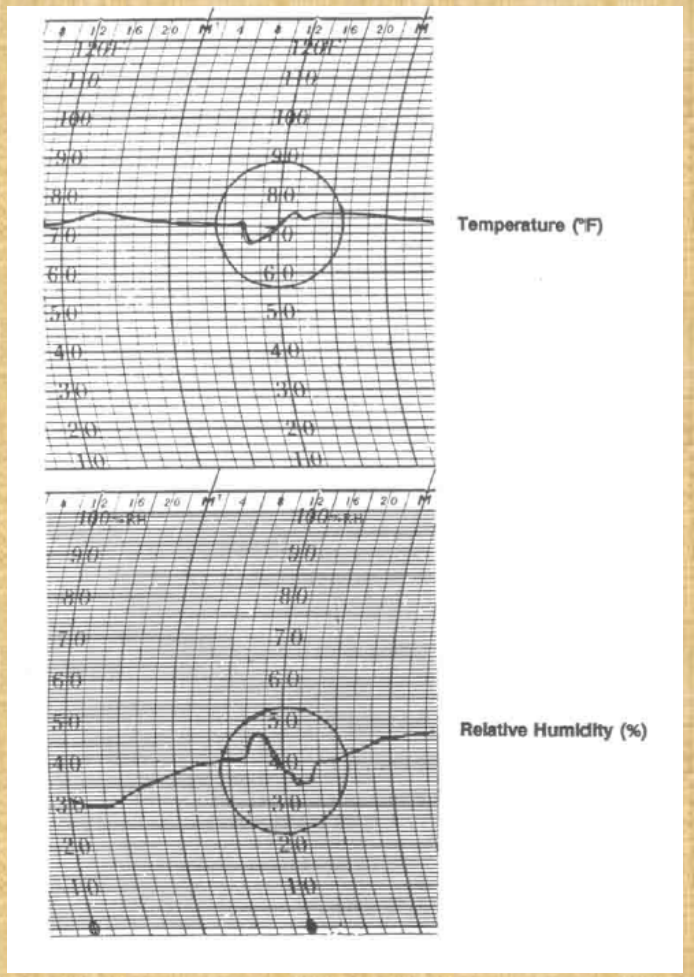
	Compactus Z1			Compactus Z2			Compactus Z3			Compactus Z4			Compactus Z5			Conservatoire IP1			Conservatoire IP2			Conservatoire IP3		
	Temp	RH		Temp	RH		Temp	RH		Temp	RH		Temp	RH		Temp	RH		Temp	RH		Temp	RH
Min :	19,37	26,63	Min :	19,23	30,33	Min :	19,55	27,43	Min :	20,20	28,92	Min :	20,11	26,04	Min :	21,56	33,42	Min :	19,77	33,42	Min :	16,59	25,29
Max :	21,49	42,84	Max :	21,44	43,68	Max :	21,40	42,93	Max :	21,84	42,80	Max :	21,55	42,41	Max :	22,60	44,67	Max :	22,60	47,15	Max :	19,95	50,00
Moyenne :	20,64	37,24	Moyenne :	20,21	38,60	Moyenne :	20,39	38,30	Moyenne :	21,15	39,09	Moyenne :	21,05	39,29	Moyenne :	22,08	39,73	Moyenne :	21,83	39,97	Moyenne :	18,33	42,30
Date Time	Temp	RH	Date Time	Temp	RH	Date Time	Temp	RH	Date Time	Temp	RH	Date Time	Temp	RH	Date Time	Temp	RH	Date Time	Temp	RH	Date Time	Temp	RH
01/01/2016 00:05	20,44	39,59	01/01/2016 00:12	19,76	41,07	01/01/2016 00:07	20,18	41,14	01/01/2016 00:15	20,93	41,28	01/01/2016 00:17	21,01	40,8	31/12/2015 23:55	22,21	43,3	31/12/2015 23:58	19,19	46,81
01/01/2016 01:05	20,46	39,88	01/01/2016 01:12	19,77	41,17	01/01/2016 01:07	20,18	41,01	01/01/2016 01:15	20,93	41,35	01/01/2016 01:17	21	41,08	01/01/2016 00:55	22,2	43,93	01/01/2016 00:58	19,19	46,94
01/01/2016 02:05	20,49	40,54	01/01/2016 02:12	19,77	41,82	01/01/2016 02:07	20,18	41,34	01/01/2016 02:15	20,93	41,62	01/01/2016 02:17	21,01	41,62	01/01/2016 01:55	22,2	43,97	01/01/2016 01:58	19,18	47,3
01/01/2016 03:05	20,52	40,87	01/01/2016 03:12	19,78	42,11	01/01/2016 03:07	20,18	41,44	01/01/2016 03:15	20,93	41,75	01/01/2016 03:17	21,02	42,18	01/01/2016 02:55	22,19	43,97	01/01/2016 02:58	19,2	47,5
01/01/2016 04:05	20,53	40,97	01/01/2016 04:12	19,78	42,21	01/01/2016 04:07	20,18	41,57	01/01/2016 04:15	20,93	41,95	01/01/2016 04:17	21,02	42,11	01/01/2016 03:55	22,19	44,07	01/01/2016 03:58	19,18	47,6
01/01/2016 05:05	20,53	41	01/01/2016 05:12	19,76	42,21	01/01/2016 05:07	20,18	41,6	01/01/2016 05:15	20,93	42,08	01/01/2016 05:17	21,02	42,11	01/01/2016 04:55	22,19	44,07	01/01/2016 04:58	19,15	47,6
01/01/2016 06:05	20,52	40,93	01/01/2016 06:12	19,75	42,18	01/01/2016 06:07	20,18	41,63	01/01/2016 06:15	20,92	42,21	01/01/2016 06:17	21,01	41,65	01/01/2016 05:55	22,19	44,13	01/01/2016 05:58	19,15	47,5
01/01/2016 07:05	20,52	40,87	01/01/2016 07:12	19,72	42,07	01/01/2016 07:07	20,18	41,57	01/01/2016 07:15	20,93	42,3	01/01/2016 07:17	21,01	41,72	01/01/2016 06:55	22,19	44,17	01/01/2016 06:58	19,13	47,46
01/01/2016 08:05	20,51	40,77	01/01/2016 08:12	19,7	42	01/01/2016 08:07	20,18	41,4	01/01/2016 08:15	20,92	42,34	01/01/2016 08:17	21,01	41,59	01/01/2016 07:55	22,18	44,2	01/01/2016 07:58	19,08	47,36
01/01/2016 09:05	20,51	40,73	01/01/2016 09:12	19,7	41,9	01/01/2016 09:07	20,18	41,4	01/01/2016 09:15	20,92	42,4	01/01/2016 09:17	21,01	41,68	01/01/2016 08:55	22,18	44,23	01/01/2016 08:58	19,08	47,18
01/01/2016 10:05	20,52	40,67	01/01/2016 10:12	19,69	41,9	01/01/2016 10:07	20,18	41,3	01/01/2016 10:15	20,91	42,47	01/01/2016 10:17	21,01	41,76	01/01/2016 09:55	22,17	44,26	01/01/2016 09:58	19,05	47,08
01/01/2016 11:05	20,54	40,67	01/01/2016 11:12	19,68	41,94	01/01/2016 11:07	20,18	41,37	01/01/2016 11:15	20,91	42,4	01/01/2016 11:17	21	41,95	01/01/2016 10:55	22,17	44,26	01/01/2016 10:58	19,05	47,08
01/01/2016 12:05	20,54	40,67	01/01/2016 12:12	19,67	42	01/01/2016 12:07	20,18	41,24	01/01/2016 12:15	20,91	42,34	01/01/2016 12:17	21	42,11	01/01/2016 11:55	22,16	44,3	01/01/2016 11:58	19,08	47,1
01/01/2016 13:05	20,54	40,67	01/01/2016 13:12	19,69	41,94	01/01/2016 13:07	20,18	41,4	01/01/2016 13:15	20,9	42,24	01/01/2016 13:17	21	42,15	01/01/2016 12:55	22,16	44,33	01/01/2016 12:58	19,12	47,13
01/01/2016 14:05	20,54	40,67	01/01/2016 14:12	19,7	41,9	01/01/2016 14:07	20,18	41,3	01/01/2016 14:15	20,91	42,21	01/01/2016 14:17	21	42,34	01/01/2016 13:55	22,16	44,33	01/01/2016 13:58	19,09	47,23
01/01/2016 15:05	20,54	40,64	01/01/2016 15:12	19,7	41,94	01/01/2016 15:07	20,18	41,4	01/01/2016 15:15	20,91	42,04	01/01/2016 15:17	21	42,31	01/01/2016 14:55	22,16	44,36	01/01/2016 14:58	19,1	47,2
01/01/2016 16:05	20,51	40,44	01/01/2016 16:12	19,68	41,74	01/01/2016 16:07	20,18	41,14	01/01/2016 16:15	20,91	41,98	01/01/2016 16:17	21	42,24	01/01/2016 15:55	22,16	44,39	01/01/2016 15:58	19,13	47,1
01/01/2016 17:05	20,5	40,34	01/01/2016 17:12	19,65	41,67	01/01/2016 17:07	20,18	41,21	01/01/2016 17:15	20,9	41,95	01/01/2016 17:17	21	42,24	01/01/2016 16:55	22,16	44,46	01/01/2016 16:58	19,09	47,07
01/01/2016 18:05	20,48	40,15	01/01/2016 18:12	19,64	41,61	01/01/2016 18:07	20,18	41,08	01/01/2016 18:15	20,9	42,17	01/01/2016 18:17	20,99	42,28	01/01/2016 17:55	22,16	44,46	01/01/2016 17:58	19,12	46,94
01/01/2016 19:05	20,48	40,11	01/01/2016 19:12	19,64	41,64	01/01/2016 19:07	20,18	41,21	01/01/2016 19:15	20,9	42,17	01/01/2016 19:17	20,99	42,28	01/01/2016 18:55	22,16	44,46	01/01/2016 18:58	19,12	46,84
01/01/2016 20:05	20,47	39,98	01/01/2016 20:12	19,61	41,54	01/01/2016 20:07	20,18	41,08	01/01/2016 20:15	20,88	42,27	01/01/2016 20:17	20,98	42,05	01/01/2016 19:55	22,16	44,46	01/01/2016 19:58	19,12	46,84
01/01/2016 21:05	20,44	39,88	01/01/2016 21:12	19,6	41,48	01/01/2016 21:07	20,17	41,03	01/01/2016 21:15	20,87	42,21	01/01/2016 21:17	20,98	41,72	01/01/2016 20:55	22,16	44,46	01/01/2016 20:58	19,09	46,78
01/01/2016 22:05	20,42	39,85	01/01/2016 22:12	19,58	41,38	01/01/2016 22:07	20,17	40,86	01/01/2016 22:15	20,86	42,21	01/01/2016 22:17	20,97	41,49	01/01/2016 21:55	22,15	44,43	01/01/2016 21:58	19,08	46,65
01/01/2016 23:05	20,43	39,75	01/01/2016 23:12	19,54	41,29	01/01/2016 23:07	20,14	40,79	01/01/2016 23:15	20,85	42,17	01/01/2016 23:17	20,96	41,06	01/01/2016 22:55	22,15	44,46	01/01/2016 22:58	19,04	46,49
02/01/2016 00:05	20,42	39,65	02/01/2016 00:12	19,52	41,06	02/01/2016 00:07	20,12	40,66	02/01/2016 00:15	20,84	42,11	02/01/2016 00:17	20,95	40,6	01/01/2016 23:55	22,14	44,46	01/01/2016 23:58	19,04	46,42
02/01/2016 01:05	20,41	39,42	02/01/2016 01:12	19,5	40,9	02/01/2016 01:07	20,1	40,53	02/01/2016 01:15	20,83	41,88	02/01/2016 01:17	20,94	40,34	02/01/2016 00:55	22,14	44,46	02/01/2016 00:58	19,07	46,23
02/01/2016 02:05	20,39	39,23	02/01/2016 02:12	19,5	40,8	02/01/2016 02:07	20,09	40,37	02/01/2016 02:15	20,82	41,85	02/01/2016 02:17	20,93	40,31	02/01/2016 01:55	22,14	44,46	02/01/2016 01:58	19,03	46,22
02/01/2016 03:05	20,37	39,15	02/01/2016 03:12	19,49	40,9	02/01/2016 03:07	20,08	40,63	02/01/2016 03:15	20,82	41,95	02/01/2016 03:17	20,93	40,24	02/01/2016 02:55	22,13	44,39	02/01/2016 02:58	19,08	46,22
02/01/2016 04:05	20,37	39,23	02/01/2016 04:12	19,5	40,86	02/01/2016 04:07	20,08	40,44	02/01/2016 04:15	20,81	41,86	02/01/2016 04:17	20,92	40,27	02/01/2016 03:55	22,12	44,39	02/01/2016 03:58	19,08	46,15
02/01/2016 05:05	20,35	39,45	02/01/2016 05:12	19,48	41,2	02/01/2016 05:07	20,06	40,47	02/01/2016 05:15	20,8	41,53	02/01/2016 05:17	20,92	40,56	02/01/2016 04:55	22,12	44,39	02/01/2016 04:58	19,1	46,22
02/01/2016 06:05	20,34	39,73	02/01/2016 06:12	19,48	41,38	02/01/2016 06:07	20,05	40,5	02/01/2016 06:15	20,8	41,66	02/01/2016 06:17	20,92	40,39	02/01/2016 05:55	22,12	44,36	02/01/2016 05:58	19,09	46,35
02/01/2016 07:05	20,33	39,99	02/01/2016 07:12	19,47	41,69	02/01/2016 07:07	20,06	40,79	02/01/2016 07:15	20,79	41,79	02/01/2016 07:17	20,92	41,46	02/01/2016 06:55	22,12	44,36	02/01/2016 06:58	19,12	46,51
02/01/2016 08:05	20,32	40,26	02/01/2016 08:12	19,47	41,88	02/01/2016 08:07	20,05	40,83	02/01/2016 08:15	20,79	41,99	02/01/2016 08:17	20,92	41,79	02/01/2016 07:55	22,11	44,27	02/01/2016 07:58	19,14	46,65
02/01/2016 09:05	20,31	40,52	02/01/2016 09:12	19,46	42,11	02/01/2016 09:07	20,05	41,13	02/01/2016 09:15	20,79	42,08	02/01/2016 09:17	20,92	41,95	02/01/2016 08:55	22,11	44,27	02/01/2016 08:58	19,15	46,84
02/01/2016 10:05	20,32	40,82	02/01/2016 10:12	19,5	42,34	02/01/2016 10:07	20,05	41,19	02/01/2016 10:15	20,79	42,15	02/01/2016 10:17	20,92	42,01	02/01/2016 09:55	22,11	44,27	02/01/2016 09:58	19,16	46,57
02/01/2016 11:05	20,33	41,21	02/01/2016 11:12	19,52	42,57	02/01/2016 11:07	20,06	41,43	02/01/2016 11:15	20,8	42,28	02/01/2016 11:17	20,92	42,05	02/01/2016 10:55	22,1	44,27	02/01/2016 10:58	19,21	47,13
02/01/2016 12:05	20,35	41,64	02/01/2016 12:12	19,57	42,8	02/01/2016 12:07	20,07	41,59	02/01/2016 12:15	20,8	42,35	02/01/2016 12:17	20,92	42,08	02/01/2016 11:55	22,09	44,3	02/01/2016 11:58	19,2	47,4
02/01/2016 13:05	20,38	41,92	02/01/2016 13:12	19,61	42,95	02/01/2016 13:07	20,08	41,82	02/01/2016 13:15	20,81	42,35	02/01/2016 13:17	20,92	42,11	02/01/2016 12:55	22,09	44,43	02/01/2016 12:58	19,2	47,6
02/01/2016 14:05	20,42	41,95	02/01/2016 14:12	19,67	42,88	02/01/2016 14:07	20,1	41,95	02/01/2016 14:15	20,83	42,27	02/01/2016 14:17	20,93	42,15	02/01/2016 13:55	22,09	44,36	02/01/2016 13:58	19,22	47,76
02/01/2016 15:05	20,43	41,69	02/01/2016 15:12	19,69	42,75	02/01/2016 15:07	20,12	41,95	02/01/2016 15:15	20,83	41,95	02/01/2016 15:17	20,93	42,18	02/01/2016 14:55	22,09	44,36	02/01/2016 14:58	19,23	47,76
02/01/2016 16:05	20,43	41,56	02/01/2016 16:12	19,63	42,62	02/01/2016 16:07	20,12	41,88	02/01/2016 16:15	20,84	42,04	02/01/2016 16:17	20,93	42,18	02/01/2016 15:55	22,09	44,36	02/01/2016 15:58	19,25	47,76
02/01/2016 17:05	20,43	41,53	02/01/2016 17:12	19,7	42,62	02/01/2016 17:07	20,13	41,95	02/01/2016 17:15	20,84	42,08	02/01/2016 17:17	20,93	42,18	02/01/2016 16:55	22,09	44,36	02/01/2016 16:58	19,28	47,78
02/01/2016 18:05	20,42	41,46	02/01/2016 18:12	19,69	42,53	02/01/2016 18:07	20,13	41,95	02/01/2016 18:15	20,84	42,11	02/01/2016 18:17	20,93	42,21	02/01/2016 17:55	22,08	44,36	02/01/2016 17:58	19,28	47,78
02/01/2016 19:05	20,42	41,36	02/01/2016 19:12	19,69	42,53	02/01/2016 19:07	20,12	41,85	02/01/2016 19:15	20,84	41,98	02/01/2016 19:17	20,93	42,24	02/01/2016 18:55	22,08	44,36	02/01/2016 18:58	19,27	47,78
02/01/2016 20:05	20,43	41,56	02/01/2016 20:12	19,69	42,62	02/01/2016 20:07	20,14	41,95	02/01/2016 20:15	20,83	42,04	02/01/2016 20:17	20,93	42,28	02/01/2016 19:55	22,08	44,33	02/01/2016 19:58	19,28	47,81
02/01/2016 21:05	20,44	41,98	02/01/2016 21:12	19,68	43,12	02/01/2016 21:07	20,12	41,98	02/01/2016 21:15	20,83	42,54	02/01/2016 21:17	20,93	42,28	02/01/2016 20:55	22,08	44,36	02/01/2016 20:58	19,27	47,94
02/01/2016 22:05	20,44	42,45	02/01/2016 22:12	19,67	43,41	02/01/2016 22:07	20,12	42,17	02/01/2016 22:15	20,83	42,67	02/01/2016 22:17	20,93	42,28	02/01/2016 21:55	22,06	44,33	02/01/2016 21:58	19,29	48,1
02/01/2016 23:05	20,44	42,68	02/01/2016 23:12	19,65	43,61	02/01/2016 23:07	20,13	42,24	02/01/2016 23:15	20,83	42,73	02/01/2016 23:17	20,93	42,28	02/01/2016 22:55	22,06	44,36	02/01/2016 22:58	19,31	48,27
03/01/2016 00:05	20,44	42,81	03/01/2016 00:12	19,67	43,65	03/01/2016 00:07	20,17	42,4	03/01/2016 00:15	20,83	42,77	03/01/2016 00:17	20,93	42,28	02/01/2016 23:55	22,05	44,43	02/01/2016 23:58	19,3	48,47
03/01/2016 01:05	20,46	42,81	03/01/2016 01:12	19,67	43,68	03/01/2016 01:07	20,17	42,47	03/01/2016 01:15	20,83	42,77	03/01/2016 01:17	20,93	42,31	03/01/2016 00:55	22,05	44,5	03/01/2016 00:58	19,29	48,54
03/01/2016 02:05	20,46	42,84	03/01/2016 02:12	19,67	43,61	03/01/2016 02:07	20,17	42,54	03/01/2016 02:15	20,83	42,8	03/01/2016 02:17	20,93	42,31	03/01/2016 01:55	22,05	44,53	03/01/2016 01:58	19,29	48,57
03/01/2016 03:05	20,44	42,75	03/01/2016 03:12	19,67	43,58	03/01/2016 03:07	20,17	42,54	03/01/2016 03:15	20,83	42,77	03/01/2016 03:17	20,93	42,34	03/01/2016 02:55	22,04	44,53	03/01/2016 02:58	19,28	48,6
03/01/2016 04:05	20,44	42,81	03/01/2016 04:12	19,67	43,41	03/01/2016 04:07	20,17	42,54	03/01/2016 04:15	20,83	42,73	03/01/2016 04:17	20,93	42,38	03/01/2016 03:55	22,04	44,57	03/01/2016 03:58	19,28	48,57
03/01/2016 05:05	20,43	42,48	03/01/2016 05:12	19,65	43,38	03/01/2016 05:07	20,17	42,54	03/01/2016 05:15	20,82	42,63	03/01/2016 05:17	20,93	42,38	03/01/2016 04:55	22,04	44,6	03/01/2016 04:58	19,28	48,47
03/01/2016 06:05	20,42	42,25	03/01/2016 06:12	19,64	43,12	03/01/2016 06:07	20,17	42,44	03/01/2016 06:15	20,82	42,48	03/01/2016 06:17	20,92	42,41	03/01/2016 05:55	22,03	44,6	03/01/2016 05:58	19,27	48,44
03/01/2016 07:05	20,41	41,98	03/01/2016 07:12	19,63	42,88	03/01/2016 07:07	20,17	42,34	03/01/2016 07:15	20,82	42,37	03/01/2016 07:17	20,92	42,38	03/01/2016 06:55	22,03	44,63	03/01/2016 06:58	19,25	48,29
03/01/2016 08:05	20,4	41,79	03/01/2016 08:12	19,63	42,82	03/01/2016 08:07	20,13	42,21	03/01/2016 08:15	20,81	42,18	03/01/2016 08:17	20,92	42,38	03/01/2016 07:55	22,02	44,67	03/01/2016 07:58	19,24	48,06
03/01/2016 09:05	20,38	41,53	03/01/2016 09:12	19,6	42,62	03/01/2016 09:07	20,13	42,21	03/01/2016 09:15	20,81	42,08	03/01/2016 09:17	20,91	42,26	03/01/2016 08:55	22,02	44,67	03/01/2016 08:58	19,22	47,93
03/01/2016 10:05	20,37	41,26	03/01/2016 10:12	19,53	42,4	03/01/2016 10:07	20,11	42,14	03/01/2016 10:15	20,81	41,92	03/01/2016 10:17	20,91	41,72	03/01/2016 09:55	22,01	44,63	03/01/2016 09:58	19,23	47,69
03/01/2016 11:05	20,34	40,93	03/01/2016 11:12	19,57	42,21	03/01/2016 11:07	20,1	42,08	03/01/2016 11:15	20,8	41,83	03/01/2016 11:17	20,9	41,46	03/01/2016 10:55	22	44,67	03/01/2016 10:58	19,24	47,46
03/01/2016 12:05	20,33	40,59	03/01/2016 12:12	19,54	41,98	03/01/2016 12:07	20,08	41,95	03/01/2016 12:15	20,8	41,63	03/01/2016 12:17	20,9	41,36	03/01/2016 11:55	21,99	44,67	03/01/2016 11:58	19,23	47,33

Resume | 01-2016 | 02-2016 | 03-2016 | 04-2016 | 05-2016 | 06-2016 | 07-2016 | 08-2016 | 09-2016 | 10-2016 | 11-2016 | ...

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

What can you do with the data/graphic ?

- Add data in registers or computer
- produce annual graphs for reports



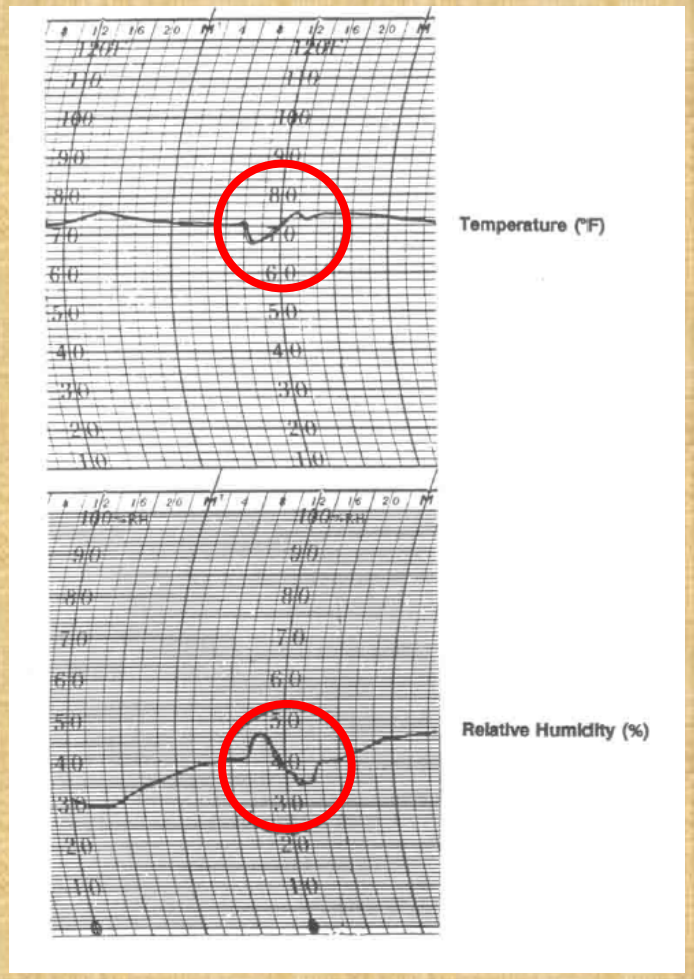
Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

What can you do with the data/graphic ?

- Add data in registers or computer
- produce annual graphs for reports

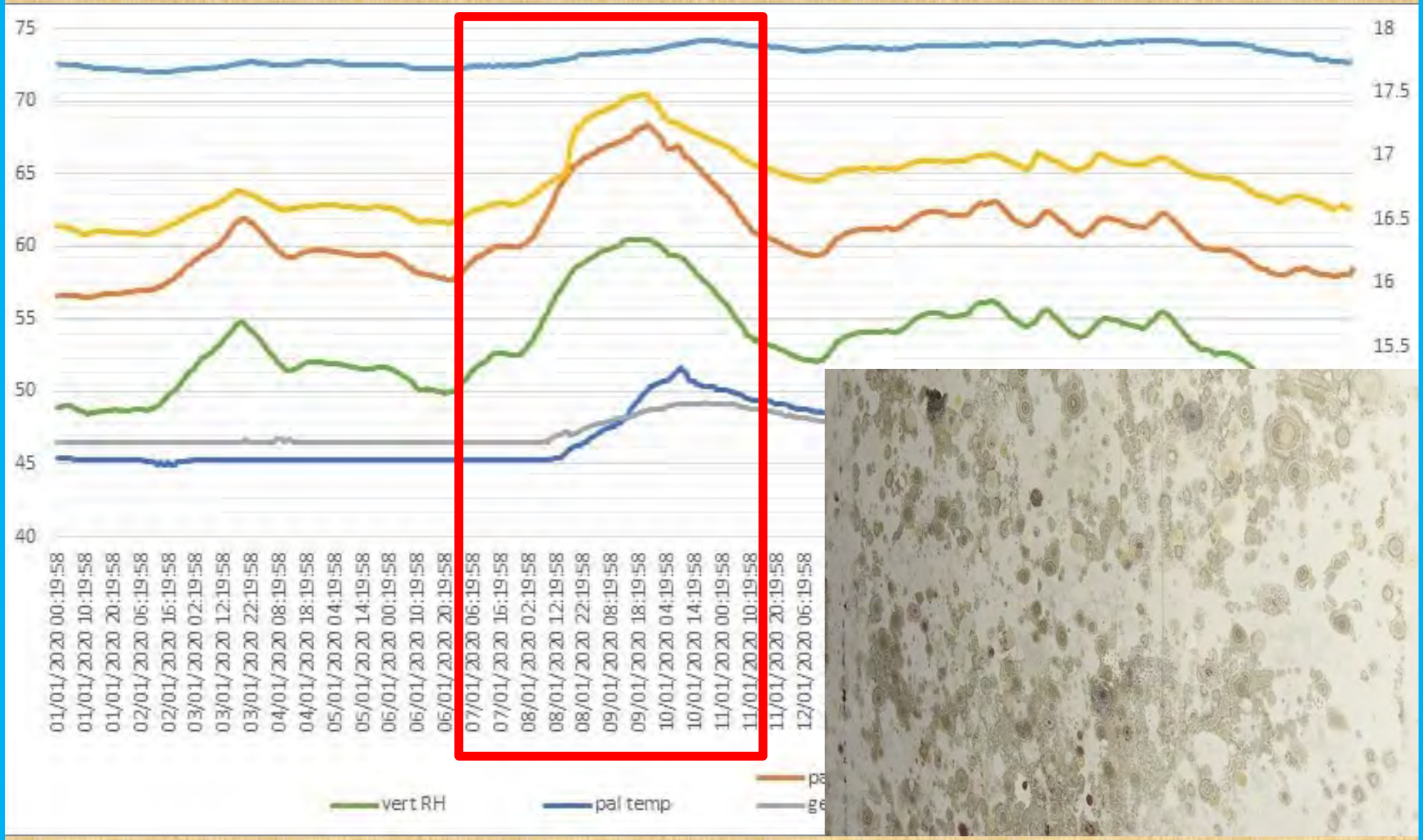
Why do you observe variations ?

Device ok ? Battery ok ?
Has the device been moved or touched ?
Is the device in full sunlight ?
Many visitors ? Is it raining ?
Dehumidifier or Heating on or off ?
Can you improve the climatic conditions ?



- Small : < 3°C et 3% -> OK
- Average : 3-6°C et 3-5% -> Bof-Bof
- Large : > 6°C et > 5% -> BEURK !!!!

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation



Chapter 4: How to durably preserve collections ?

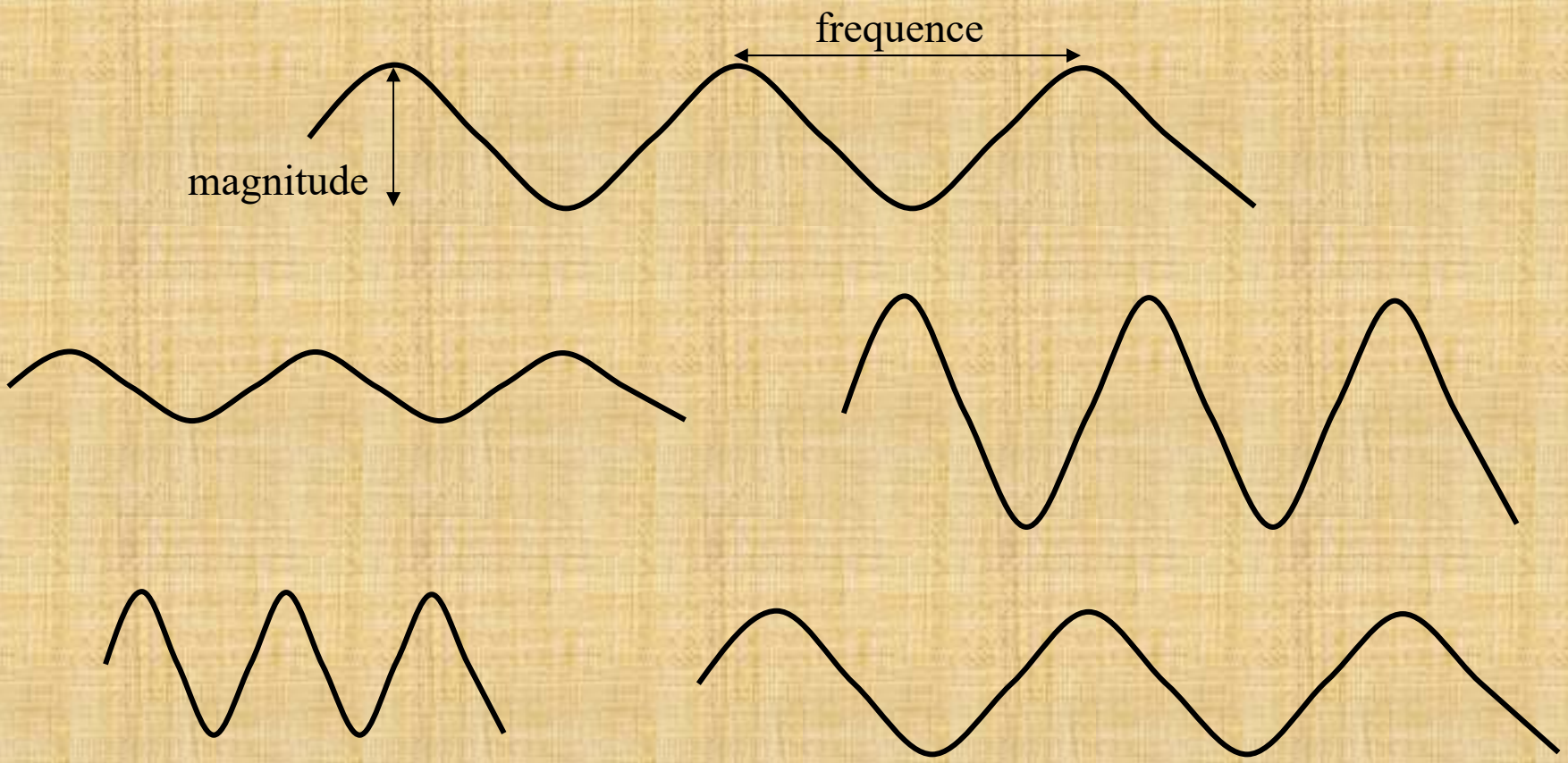
Chaptre 4.2: External causes of damage and degradation

1. Human
2. Temperature
3. Relative Humidity
4. Light

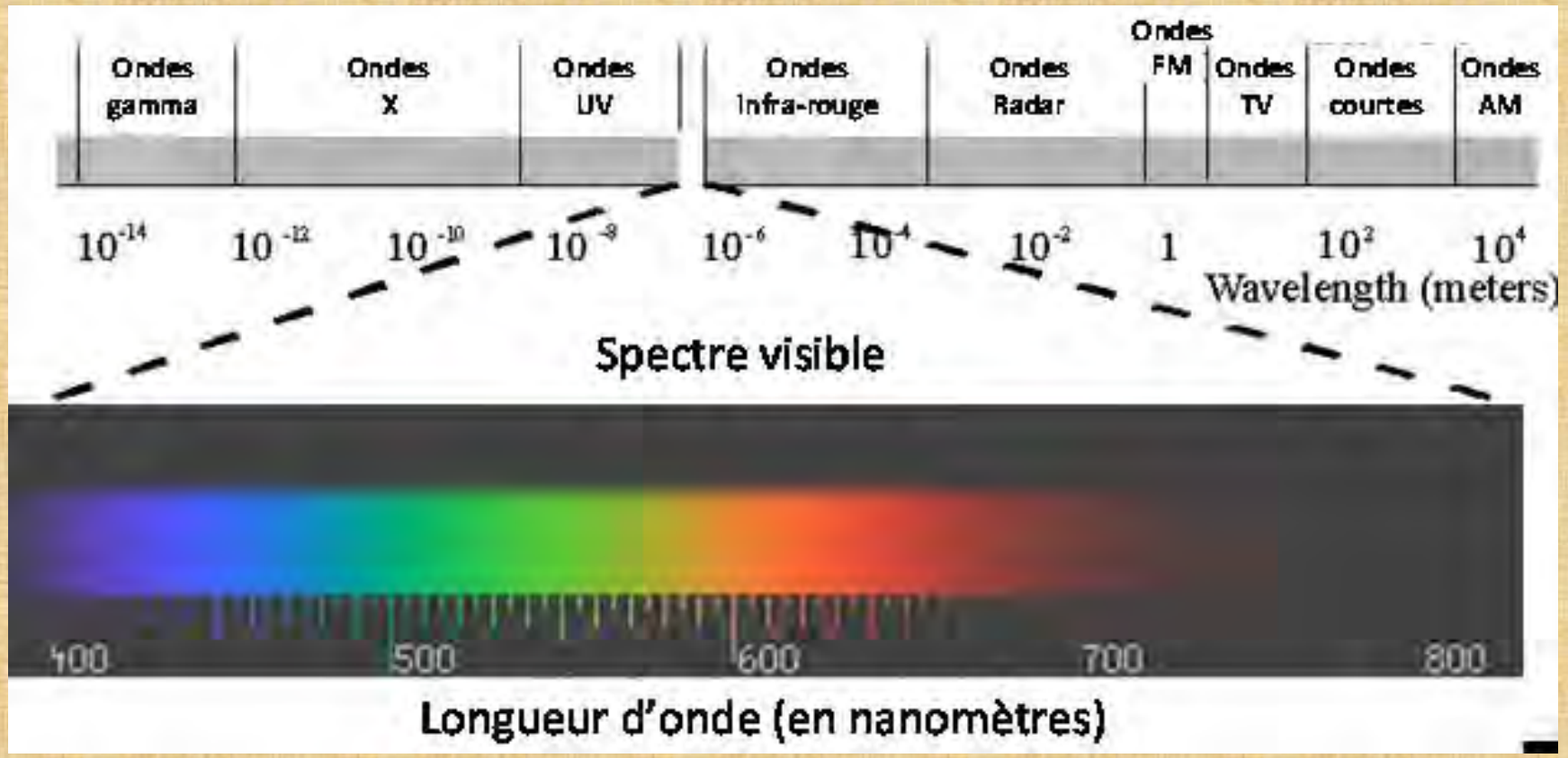
Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

Light = electromagnetic wave



Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

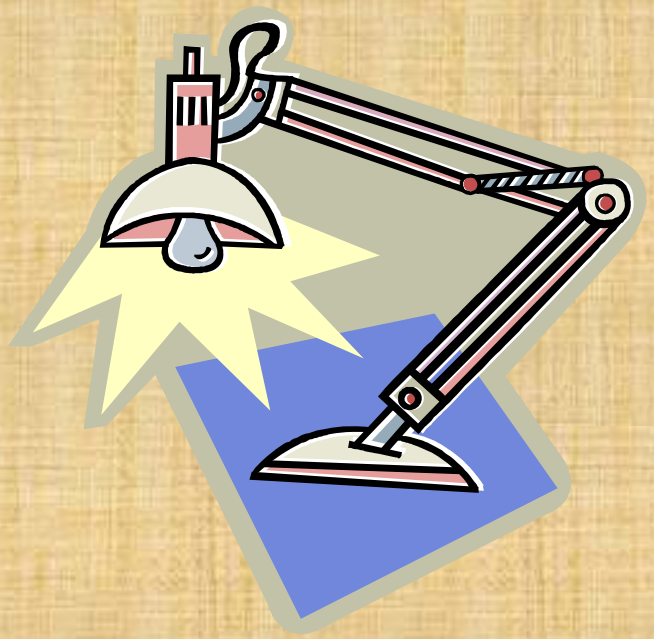


Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

- Type of light

natural



artificial

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

- Type of light

- UV = very dangerous
- visible = less dangerous

Photo: Anne Botman. © Canadian Museum of Nature / Musée canadien de la nature.

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

- Type of light

- UV = very dangerous
- visible = less dangerous
- IR = heat -> drying out

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

	IR rays	**Visible light**	**UV rays**
Sun	A lot	A lot	A lot
Incandescence lamp	A lot	Less than the sun	A little
Halogen lamp	A lot	More than the previous lamp	A lot except if you use filters
Luminescent tube	A little	More than the previous lamp	Dependent of the type
Optic fibre	A little or nothing	More than incandescence lamp	A little or nothing
LED	Very few	More and more	Very few

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

- Type of light
- Quantity of light

200 lux

500 lux

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

- Type of light
- Quantity of light
- Exposure time

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

sensitive

less sensitive

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

luxmeter

UV-meter

datalogger

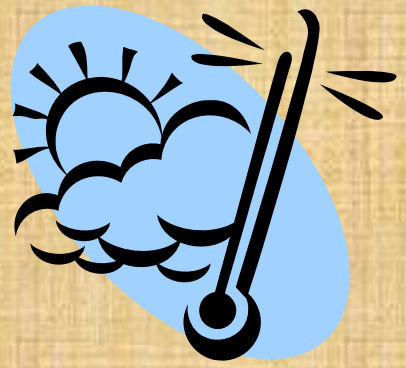
Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human
2. Temperature
3. Relative Humidity
4. Light
5. Air quality

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation



outdoor air quality
(filtered?)

indoor air quality
(influenced by collections?)

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human
2. Temperature
3. Relative Humidity
4. Light
5. Air quality
6. Mechanical forces

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

mechanical forces :

- handling (frictions, vibrations, falls, …)
- packaging (frictions, falls, …)

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

mechanical forces :

- handling (frictions, vibrations, falls, …)
- packaging (frictions, falls, …)
- transportation (frictions, vibrations, …)

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

mechanical forces :

- handling (frictions, vibrations, falls, …)
- packaging (frictions, falls, …)
- transportation (frictions, vibrations, …)
- storage (vibrations, …)

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

mechanical forces :

- handling (frictions, vibrations, falls, …)
- packaging (frictions, falls, …)
- transportation (frictions, vibrations, …)
- storage (vibrations, …)

→ touch and move a minimum !

in your own museum !

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

- wear gloves (avoid sweat and fat)
  - cotton
  - latex/nitril (not for photos and silver)

- handle objects or drawers correctly (gently, head up,...)

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human
2. Temperature
3. Relative Humidity
4. Light
5. Air quality
6. Mechanical forces
7. Flooding and Fire

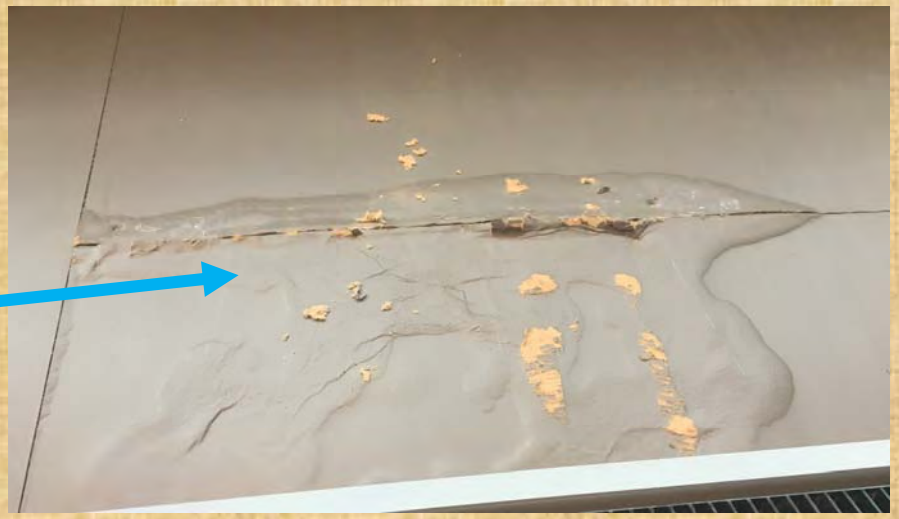
Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

National History Museum Rio, Brazil; 2nd September 2018

Notre Dame de Paris, France; 15-16th April 2019

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation



Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

1. Human
2. Temperature
3. Relative Humidity
4. Light
5. Air quality
6. Mechanical forces
7. Water and Fire
8. Storage

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

Optimal storage
Difficult !

Take into account the use of the object (scientific study, exhibition,...

Chapter 4: How to durably preserve collections ?

Chaptre 4.2: External causes of damage and degradation

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

Natural History Museum, Albukerke, USA, October 2018

RBINS

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

1. Human

2. Temperature

3. Relative Humidity

4. Light

5. Air quality

6. Mechanical forces

7. Water and Fire

8. Store in a safe place

9. moulds and pests

Chapter 4: How to durably preserve collections ?
Chaptre 4.2: External causes of damage and degradation

feed on organic matter (paper, wood, textiles, etc.)

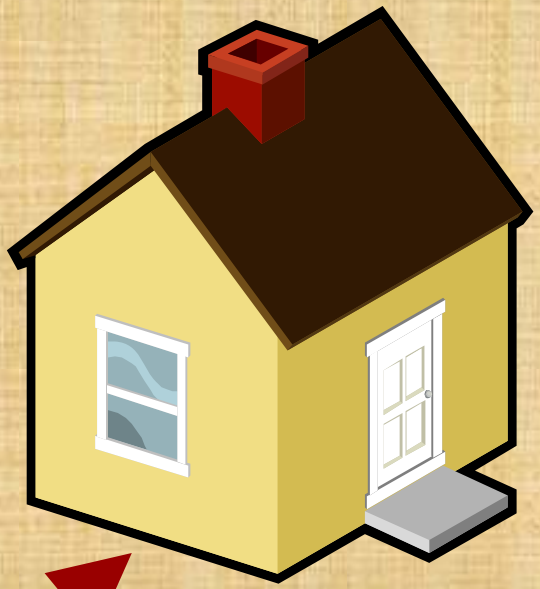
moulds

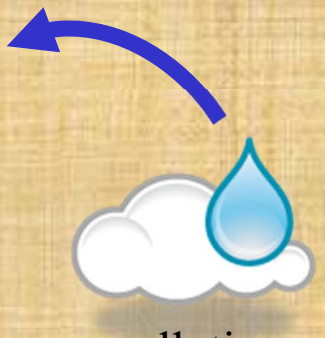
Insects

Rodents

RH
T°

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

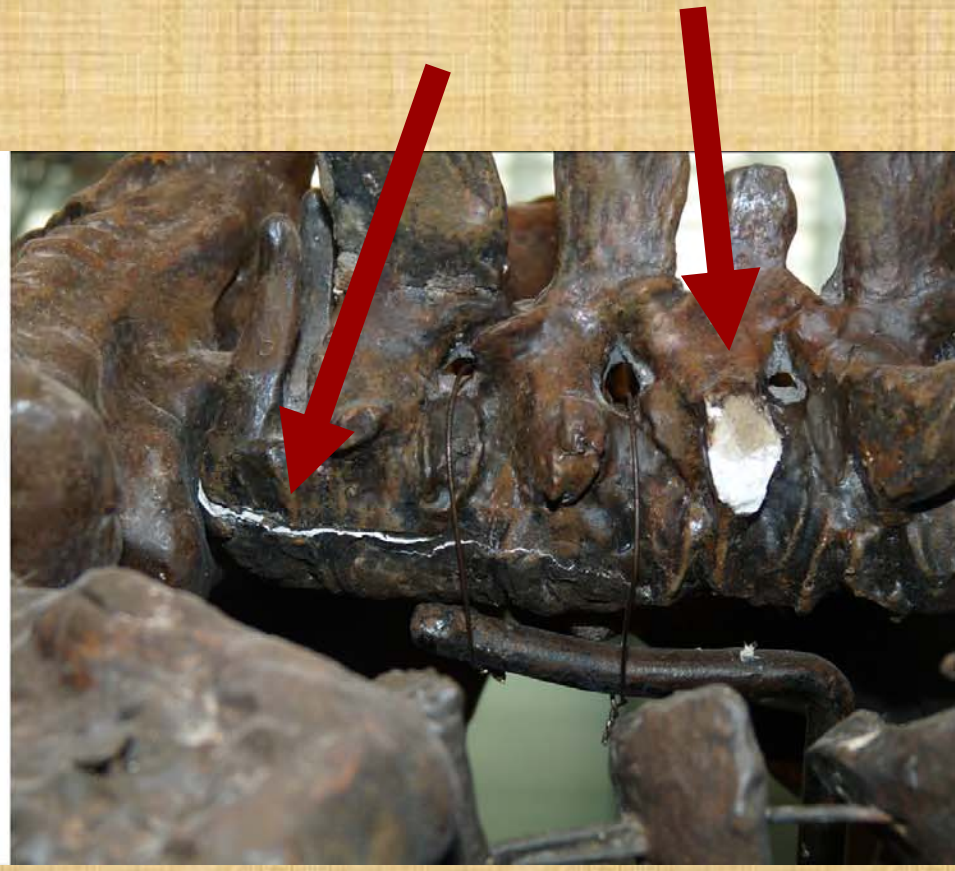




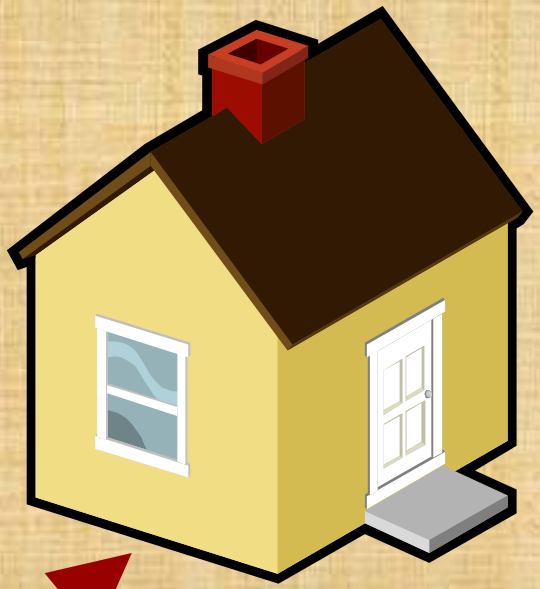
pollution
T°
RH

- stable zone

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages



Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages



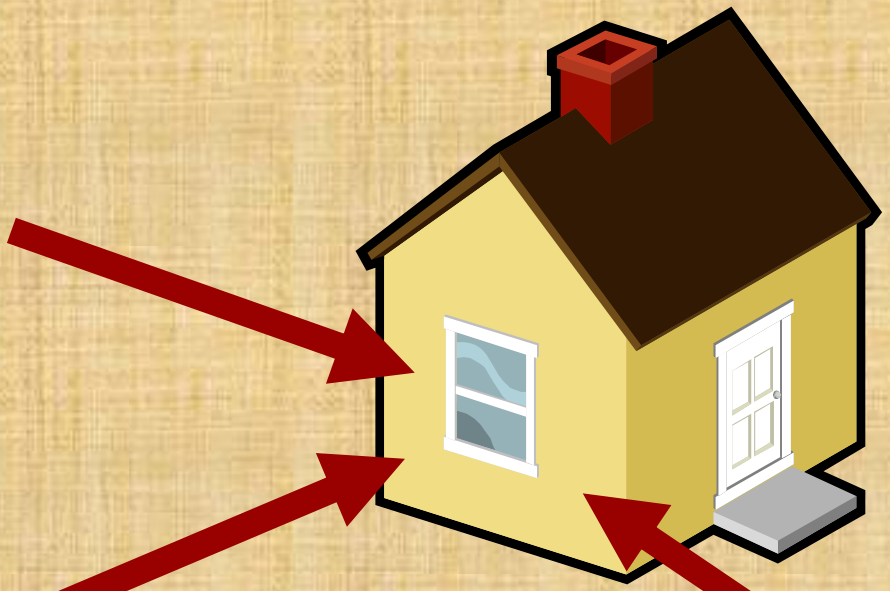
pollution
T°
RH

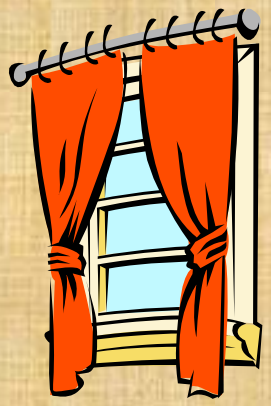
- stable zone
- dark and cool (few variations of T° and RH)

Storage room / reserve = treasure chest
-> apply strict rules to create an optimal environment for conservation !!!

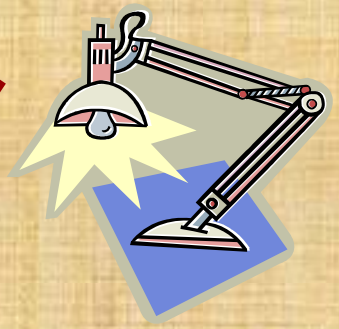
Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

1. Light





screens



Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

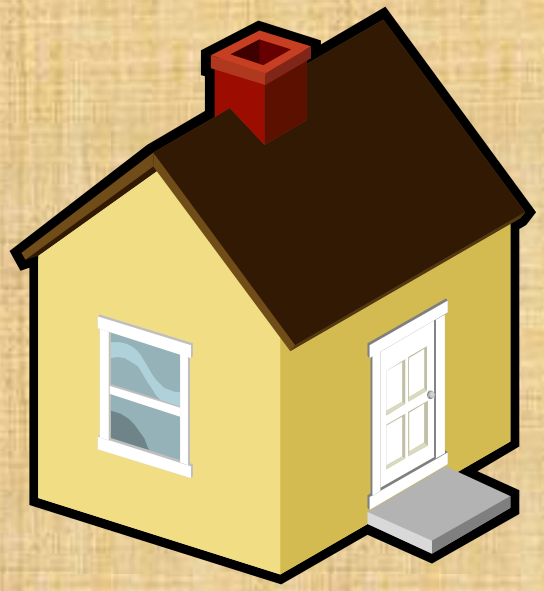
1. Light

→ Avoid plants, drinks or food in the strorage rooms

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

2. Temperature

~~Work~~



16-18°C
-> 20°C

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

2. Temperature

→ Colder ok ? → Yes except if transportation

⚠ Condensation (T° to RH)

→ few variations
Season variations
Day/night variation

⚠ max 3°C/24h

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

3. Relative Humidity

Key factor as organic material very sensitive

→ few variations → OK between 48 and 55%
< 30% = drying out
> 60-65% = moulds

max 3%/24h

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

Material	**Temperature** **max °C**	**min °C**	**Relative Humidity %**
Papers, manuscripts, paintings, drawings, taxidermies, ivory, leather, wood, varnished objects, skeletons, most of the fossils, limestone, …	16-18	2	48-55
Photos	Fresher is better	Attention : conden-sation	About 30
Metal	16-18	2	≤ 45
Tin (Sn)	16-18	14	-
Minerals and stones	16-18	16	30-50
Sculptures	16-18	2	-
Ceramics, flooring, glass, …	16-18	5	48-55
Liquid preparations	16-18	2	35-50
Precious metals : Gold, Platinum, …	-	-	-

Chapter 5: Preventive conservation
Chapter 5.1: Environment of the storages

4. Air quality

Good ventilation

(stagnant air promotes moulds)

-> actions:

- local (glass cage, absorbers)
- general (air conditioning system)

-> maintain the equipment used!

(change filters, bags,...)

no direct contact with the object !!

Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

Temperature

Relative Humidity

Light

Air quality

Mechanical forces

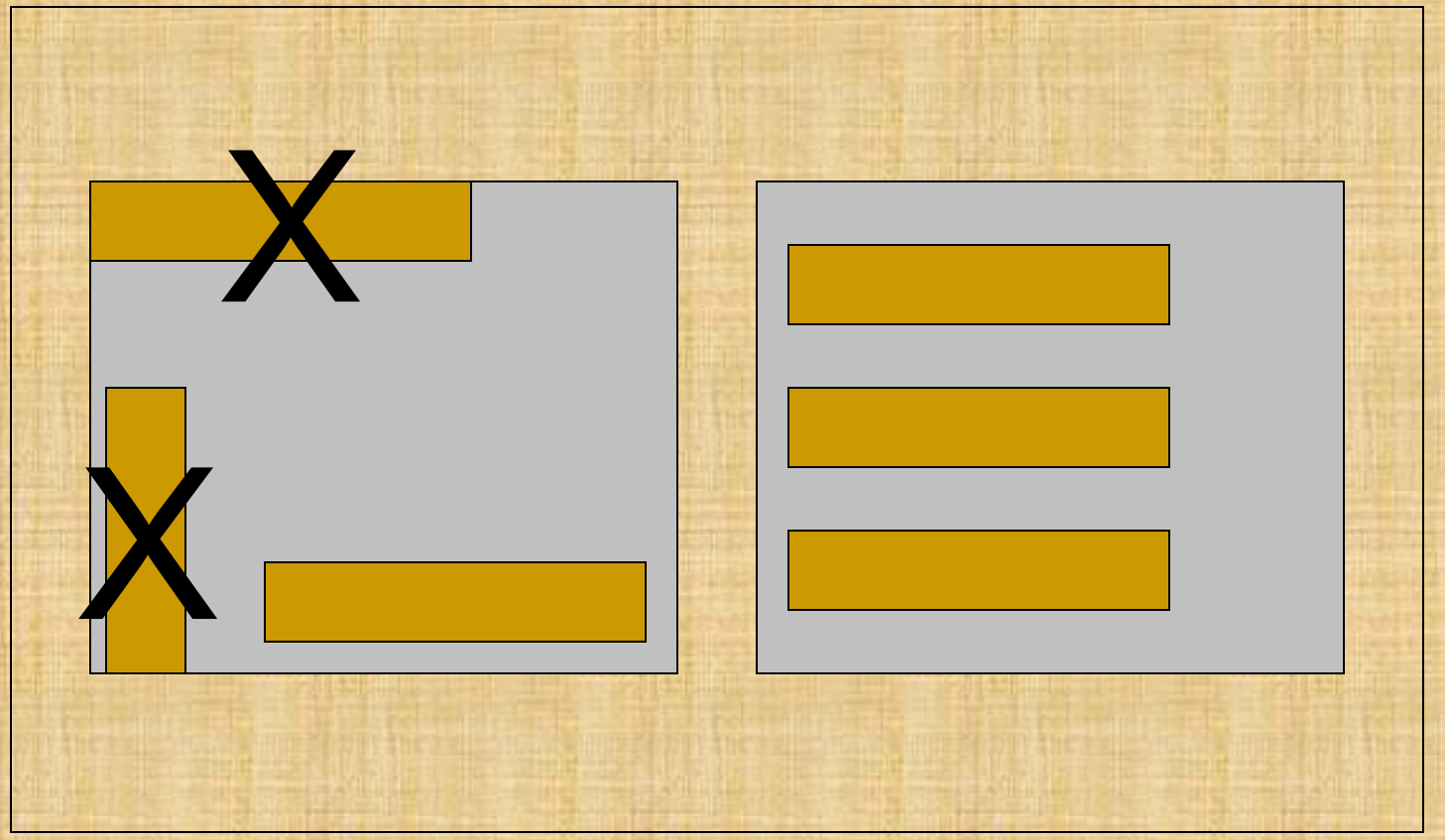
moulds and pests

1. storage furniture

2. storage boxes/material

Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

no cabinets near external walls



Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

no cabinets near external walls

→ condensation → moulds

the fixed wooden cabinet

benefits:
- strong
- few vibrations
- buffer role for RH

disadvantages:
- production of chemicals !!
  - oak = acetic and formic acid
  - pine, meranti = less acidity

→ Painting, varnish ?

the fixed metal cabinet

benefits :
- stable (no chemicals) but
  be careful with paintings and lacquers

disadvantages:
- amplify vibrations
- no buffer for RH
- sensitive to condensation

no metal against metal
galvanic corrosion

the compactus system

benefits:
- space saving
- no dust

disadvantage:
- vibrations

→ handle with care

shelvings

benefits:
- fixed or mobile
- easy to move and transform

disadvantages:
- dust
- light

- coton/inert sheets
- shock absorbers
- boxes

Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

Temperature

Relative Humidity

Light

Air quality

Mechanical forces

moulds and pests

1. storage furniture

2. storage boxes/material

Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

- protects against light, dust and "vermin"
- protects against climatic variations
- protects against air pollution

Chapter 5: Preventive conservation

Chapter 5.2: Storage equipment

- inert material
- does not react with the object
- does not react with the environment
- acid-free paper, cardboard, plastic (polyethylene, polypropylene, some polyester)

Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

- inert material
- does not react with the object
- does not react with the environment
- acid-free paper, cardboard, plastic
(polyethylene, polypropylene, some polyester)

No Polyvinyl chloride !

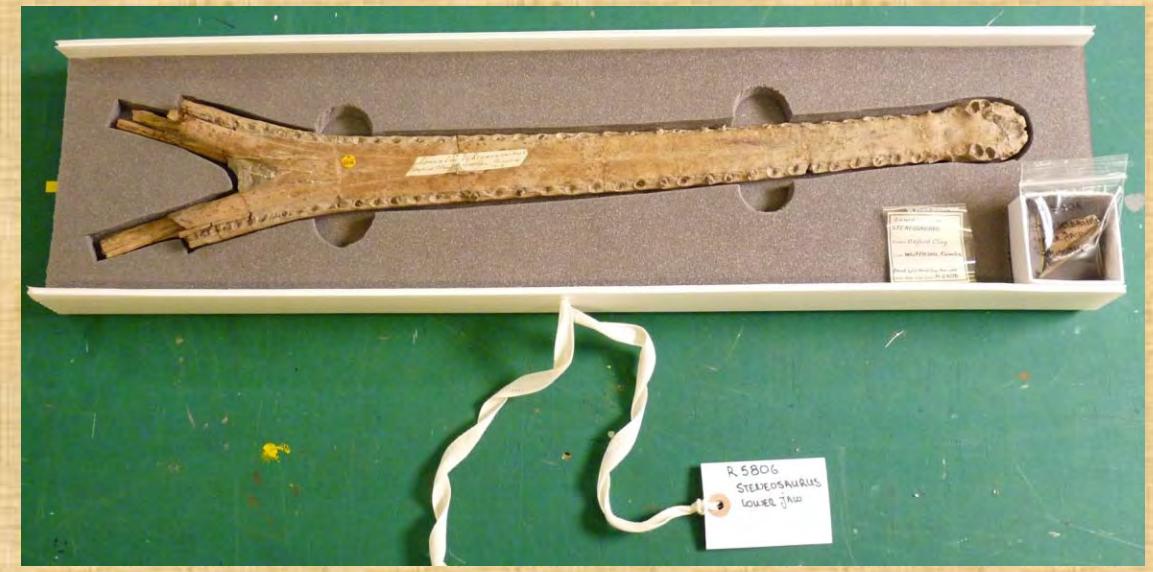
« non acidity » not eternal

- pH meter
- acid-free buffered cardboard

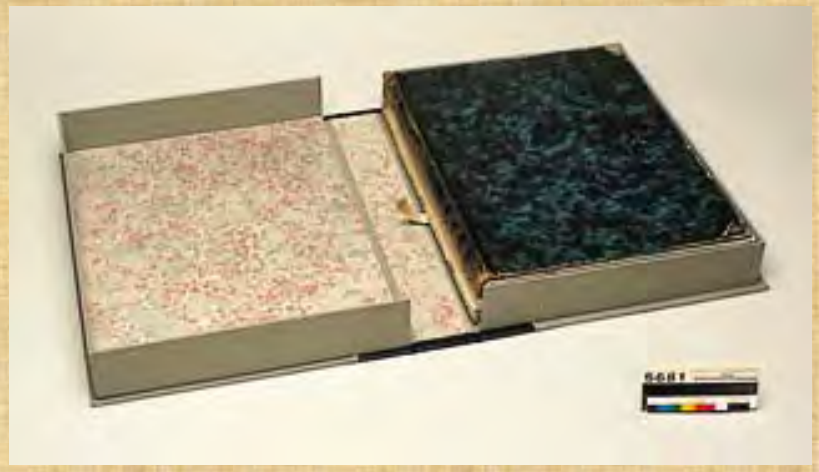
Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

- stabilize objects
  - inert material (boxes, foam, plastic bags)
  - block boxes, bags,... in the drawer
  - move objects away from each other
  - do not overlay them

- choose an appropriate storage for the object

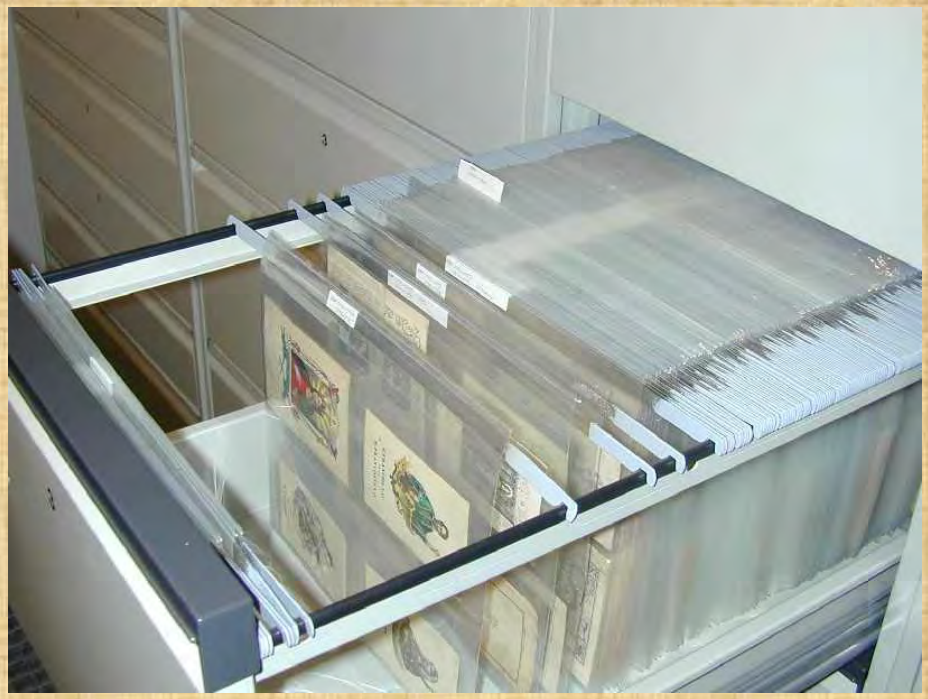


Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment



Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment



Chapter 5: Preventive conservation
Chapter 5.2: Storage equipment

Appropriate storage ?

Chapter 6: Preventive conservation: specimens on display

Public !

T° ↗ **RH ↗**

CO2 ↗

Damage ↗

Pollution ↗

→ changing rooms + doormat

Chapter 6: Preventive conservation: specimens on display

Chapter 6.1: Temperature & Relative Humidity

- Humidifier/Dehumidifier
- Heather
- Climatisation
- Specific Polymers

Art Sorb

Chapter 6: Preventive conservation: specimens on display

Chapter 6.2: Light and specimens

the lighting must be sufficient but be careful :

- the type of light (UV, IR, …)
- the intensity of the light (heat ?)
- the timing of exposure

-> cold light (LED, optical fibres)
-> communicate with the exhibition managers !!!!

for sensitive objects :

- do not leave the specimen permanently
- use a button or sensor to turn on the light
- put screen or UV filters on windows

Chapter 6: Preventive conservation: specimens on display
Chapter 6.2: Light and specimens

The Tasmanian Wolf

The thylacine, also known as the Tasmanian wolf or Tasmanian tiger, is an Australian marsupial. Or at least it was: the last one died in 1936. Systematically eradicated by humans, the species' ability to open its mouth widely was thought to be detrimental to sheep farming. However, it was a quiet and easily tameable animal.

The thylacine exhibited in this room has been part of our collection since 1871! It is a very rare and fragile historic specimen, so humidity and lighting have to be well adjusted. That is why the light only switches on when there is someone nearby.

In the hall, you can watch a video of the last thylacine to be captured and hear its heartbreaking howl.

Chapter 6: Preventive conservation: specimens on display

Chapter 6.2: Light and specimens

Chapter 6: Preventive conservation: specimens on display

Chapter 6.3: Specimens in glass cages

public ! → want to touch objects !!!!

→ Place them in glass cages

avantages:

- protection
- create a microclimate
  - T°, RH, light (UV filters),...
  - protects against insects and dust
  - local air conditioning (expensive)
- datalogger to monitor sensitive objects

- must be acid free!

Chapter 6: Preventive conservation: specimens on display

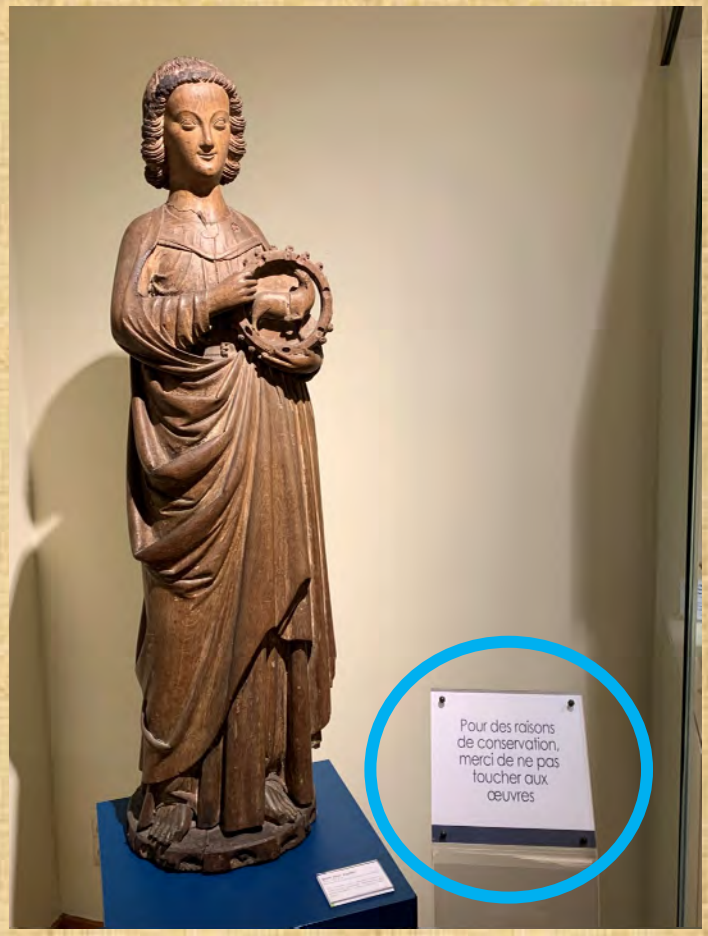
Chapter 6.3: Specimens in glass cages

Chapter 6: Preventive conservation: specimens on display

Chapter 6.4: Specimens out of glass cages

if glass is not possible (object too large, …):

- paint a line of colour on the floor or place a board



Chapter 6: Preventive conservation: specimens on display

Chapter 6.4: Specimens out of glass cages

if glass is not possible (object too large, …):

- paint a line of colour on the floor or place a board

- attach the objects up to the visitors

Chapter 6: Preventive conservation: specimens on display

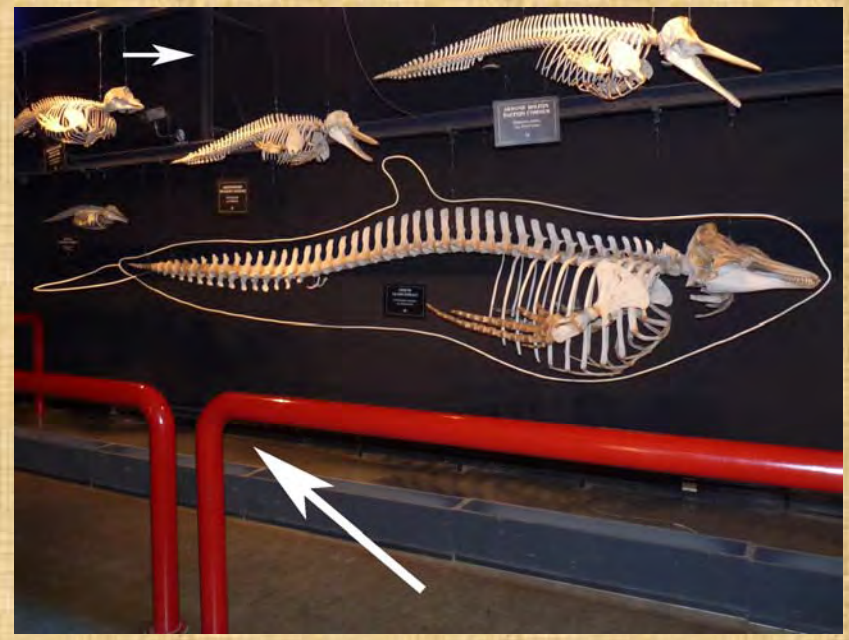
Chapter 6.4: Specimens out of glass cages

if glass is not possible (object too large, …):

- paint a line of colour on the floor or place a board

- attach the objects up to the visitors

- place a rope, a screen, a plexiglass, a grid, ...)

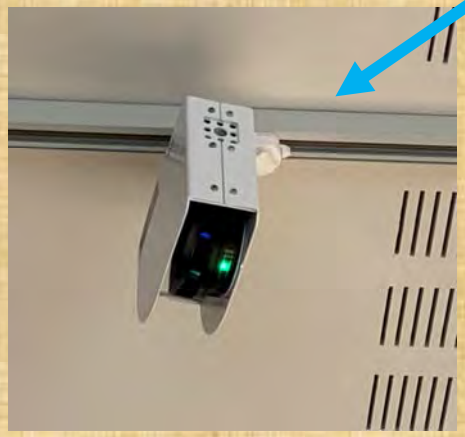


Chapter 6: Preventive conservation: specimens on display

Chapter 6.4: Specimens out of glass cages

if glass is not possible (object too large, …):

- paint a line of colour on the floor or place a board
- attach the objects up to the visitors
- place a rope, a screen, a plexiglass, a grid, ...)
- install an alarm system



Chapter 6: Preventive conservation: specimens on display

Chapter 6.4: Specimens out of glass cages

if glass is not possible (object too large, …):

- Have a frequent look to the specimens (security, stability)

Chapter 6: Preventive conservation: specimens on display

Chapter 6.4: Specimens out of glass cages

if glass is not possible (object too large, …):

- Have a frequent look to the specimens (security, stability)

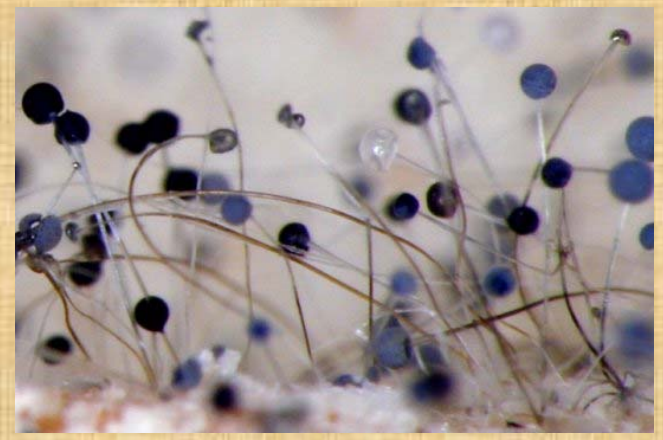
What are the risks ?

Chapitre 7: Integrated Pest Management (IPM)

Chapter 7.1: What is IPM ?

pests = useful cleaners in nature (leaves, dead wood and animals)

→ feed on organic matter (paper, wood, textiles, etc.)



moulds

Insects

Rodents

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

1. Prevention
   -> hostile environment for pests

2. Partitioning
   -> controle of incoming specimens (loans, gifts, …)

3. Detection
   -> inspect for pests or evidences

4. Quarantine
   -> for areas and objects

5. Fighting
   -> choose an appropriate solution

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

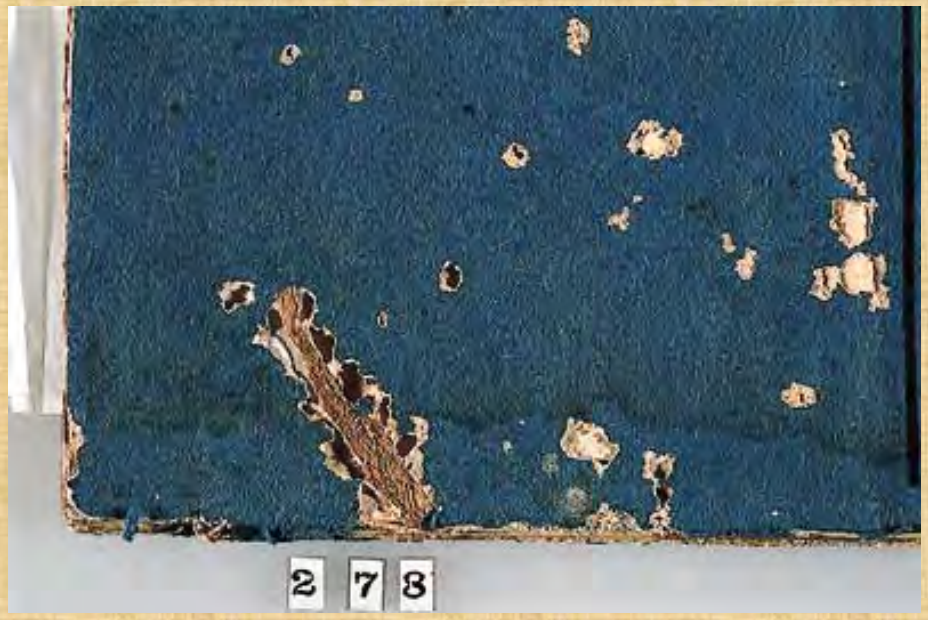
3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …



Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …
- small dust accumulations next to an object

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …
- small dust accumulations next to an object

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …
- small dust accumulations next to an object
- traces of moulds, cocoons, excrement

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

attention to :
- eaten parts of a specimen, a piece of furniture, …
- small dust accumulations next to an object
- traces of moulds, cocoons, excrement
- dead insects

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
   -> inspect for pests or evidences

detection methods (traps):
- glued traps
   = cardboard + glue layer
   + attractant: food or pheromones
      (species-specific substances that causes a given reaction)

- light traps
   = UV! -> only for enclosed objects because UV are harmful to the collections!

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.2: IPM strategy: the 5-point plan

3. Detection
-> inspect for pests or evidences

detection methods (traps):
- glued traps
= cardboard + glue layer
+ attractant: food or pheromones
(species-specific substances that causes a given reaction)

- light traps
= UV! -> only for enclosed objects because UV are harmful to the collections!

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.3: Identification of pests

Insects

wood insects, woodborers

furniture beetle
common house borer
Anobium punctatum

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.3: Identification of pests

Insects

wool, furs, feathers, textiles

<u>beetles</u>

varied carpet beetle - ***Anthrenus verbasci***
museum beetle - ***Anthrenus museorum***

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.3: Identification of pests

Insects

wool, furs, feathers, textiles

<u>mites</u>

common clothes moth
Tineola bisselliella
(larvae)

Chapitre 7: Integrated Pest Management (IPM)
Chapter 7.3: Identification of pests

Rodents

rat

Eat and use for their nests :
- paper
- textile
- wood

dirty with their droppings

mouse

are hiding to die
-> food for insects

Et voilà !!!
It's done!