

# Sonification de données caractéristiques de micro-organismes

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# OBJECTIFS

- Associer une empreinte sonore à des échantillons de champignons marins et terrestres.
- Allier sciences biologiques et musicales pour faire découvrir la diversité du vivant à l'aide d'un support auditif.

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**I. ÉTAT DE L'ART**

**II. DONNÉES**

**III. SYNTHÈSE DE SON**

**IV. QUALITÉ DU SON**

**V. CONCLUSION**

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# I. ÉTAT DE L'ART - DÉFINITION

“La sonification est la représentation et l'émission de données sous forme de signaux acoustiques non verbaux aux fins de la transmission ou de la perception d'information”

Définition par Wikipédia

# I. ÉTAT DE L'ART - UTILISATION

- Détecteur de métaux
- Compteur Geiger
- Sonar
- Appareils médicaux
- Instruments de cockpit

# I. ÉTAT DE L'ART - MUSIQUE

- Encoder les structures moléculaires par la musique :

*Molecular Sonification for Molecule to Music Information Transfer, Babak Mahjour et al.*

- Transformer les nombres d'ondes de spectroscopie en notes :

*The Sound of Chemistry: Translating Infrared Wavenumbers into Musical Notes, Neil Garrido et al.*

- La même chose avec les fréquences en spectroscopie :

*Molecular Music: A Modern Accompaniment to NMR Pedagogy, Srikar Munukutla et al.*

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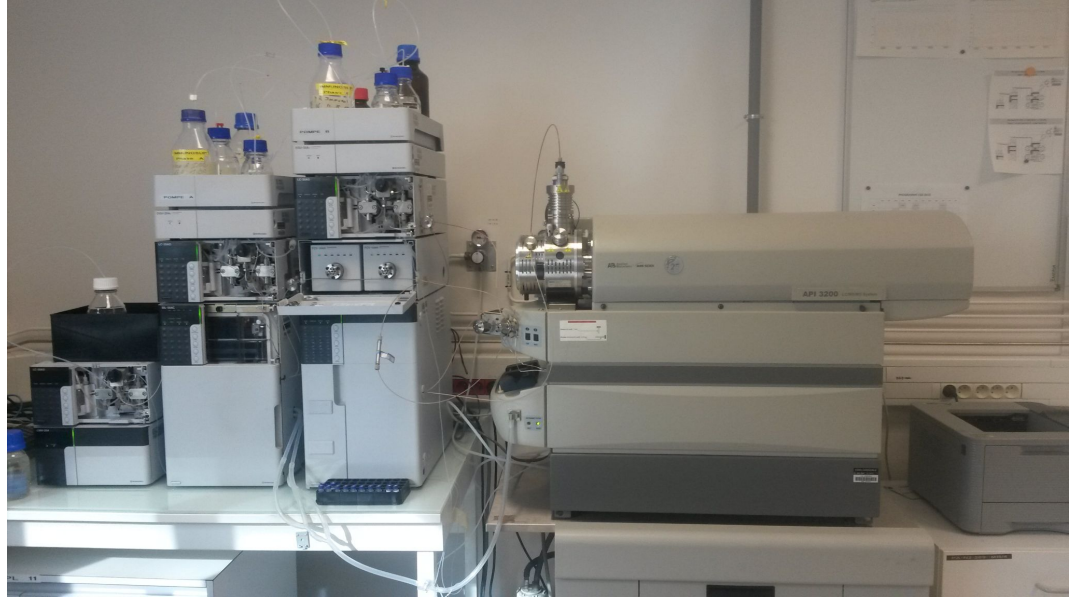
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## II. DONNÉES - SPECTROMÈTRE DE MASSE

Récupération à l'aide  
d'un spectromètre  
de masse.



Source : <https://biologie.chu-grenoble.fr/spectrometrie-de-masse>

## II. DONNÉES - FORMATS

	0	0.0083	0.015	0.0217	0.0283	0.035
100.110349745977	0	0	0	0	0	0
102.010985056559	0	0	0	0	0	0
102.032212189705	0	0	0	0	0	0
102.535130092076	0	0	0	0	0	0
109.012079753573	0	0	0	0	0	0
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110.522608757019	0	0	0	0	0	0
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111.521388583713	0	0	0	0	0	0
112.015762329102	0	0	0	0	0	0
112.085187639509	0	0	0	0	0	0

Format "matrice"

1,110.0203mz,33.73min	4.237833669319229E8
2,610.1809mz,31.62min	6.4338899483418785E7
3,536.1630mz,29.90min	3.386854857488172E7
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11,136.1120mz,34.41min	2.2015390026075023E8
12,226.9507mz,33.27min	1.0567302963366274E7
13,164.1431mz,34.67min	1.8171019355812475E8
14,119.0857mz,0.26min	8.133589593461065E7
15,538.1614mz,29.90min	1.1832913865853835E7
16,158.9640mz,33.27min	9597751.248339877

Format "vecteur"

## II. DONNÉES - ANALYSE

	Masse (mz)	Temps (min)	2905.mzML
count	953.000000	953.000000	2.570000e+02
mean	401.237266	12.775593	2.848970e+07
std	182.765170	9.082042	1.508230e+08
min	100.076200	0.070000	1.153957e+03
25%	251.090900	3.450000	6.486626e+03
50%	385.221100	12.790000	6.871151e+04
75%	529.268100	17.630000	3.114525e+06
max	799.563300	33.730000	1.377023e+09

## II. DONNÉES - ANALYSE

	Masse (mz)	Temps (min)	2905.mzML
count	953.000000	953.000000	257.000000
mean	401.237266	12.775593	11.926353
std	182.765170	9.082042	3.511650
min	100.076200	0.070000	7.050952
25%	251.090900	3.450000	8.777498
50%	385.221100	12.790000	11.137672
75%	529.268100	17.630000	14.951587
max	799.563300	33.730000	21.043190

## II. DONNÉES - MÉTHODE

Temps dans les données → Temps dans le son

Masse (rapport  $m/z$ ) → Fréquence

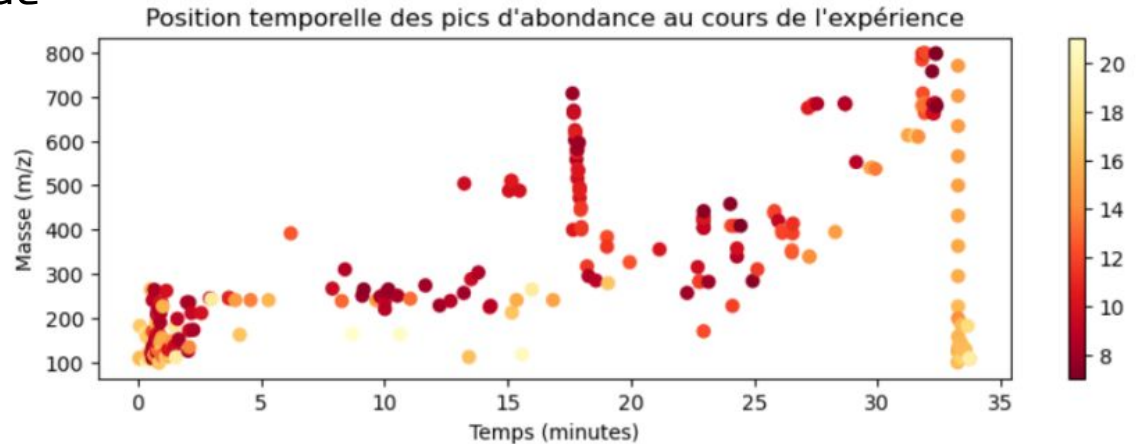
Abondance → Amplitude

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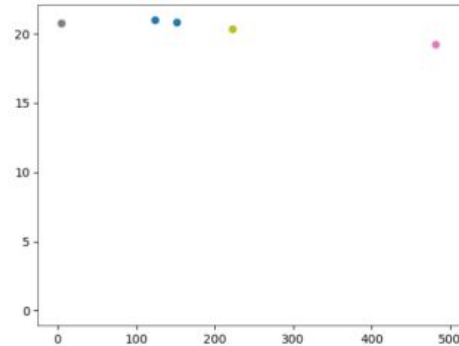
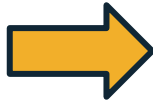
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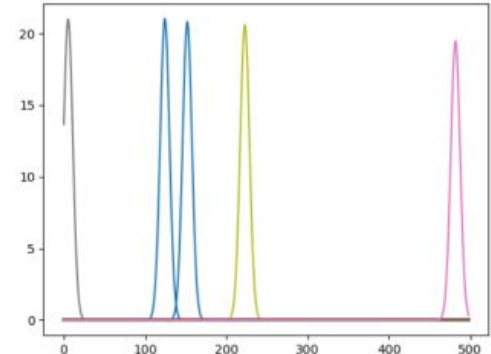
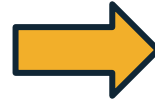
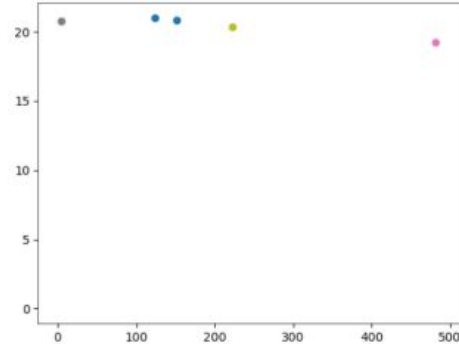
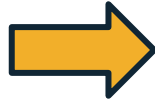
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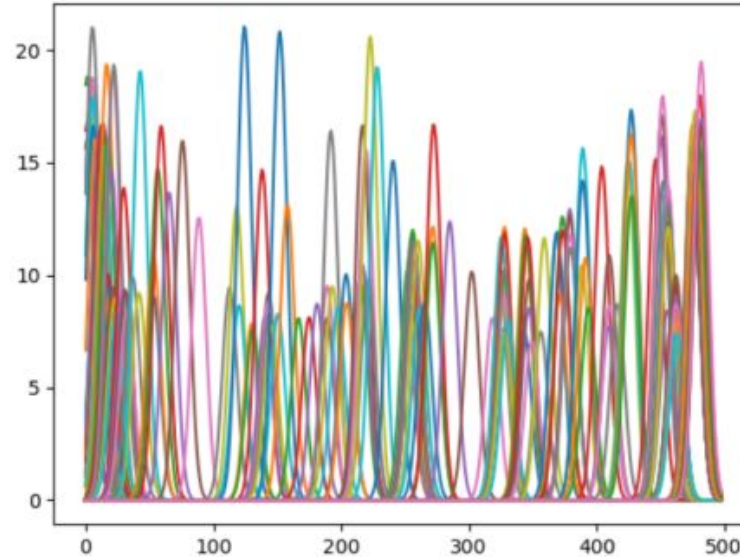


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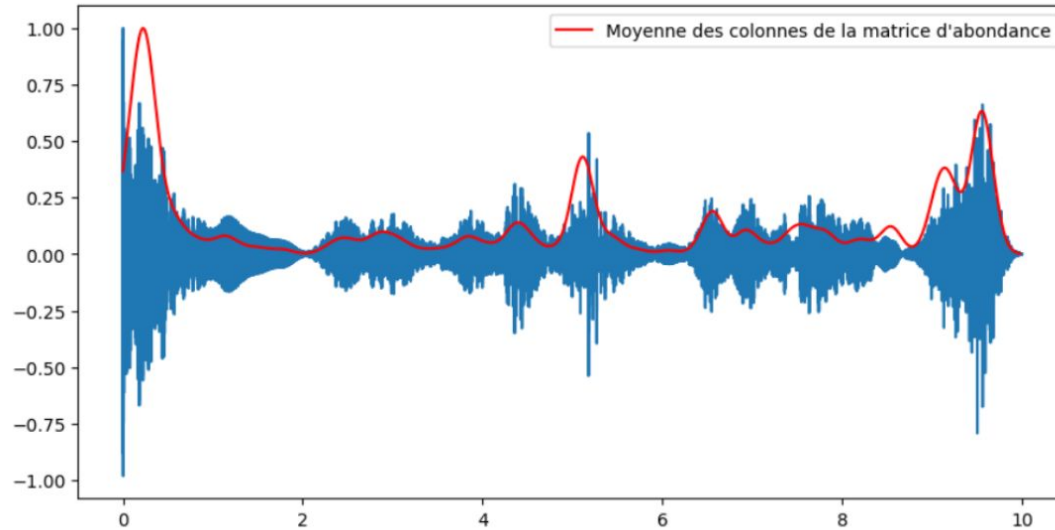


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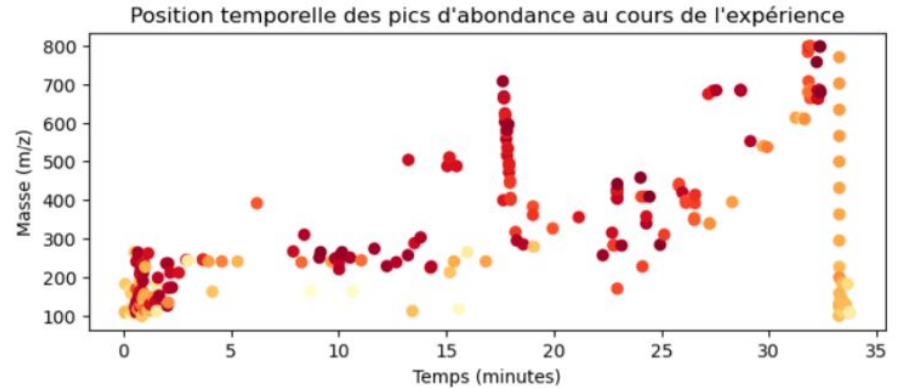
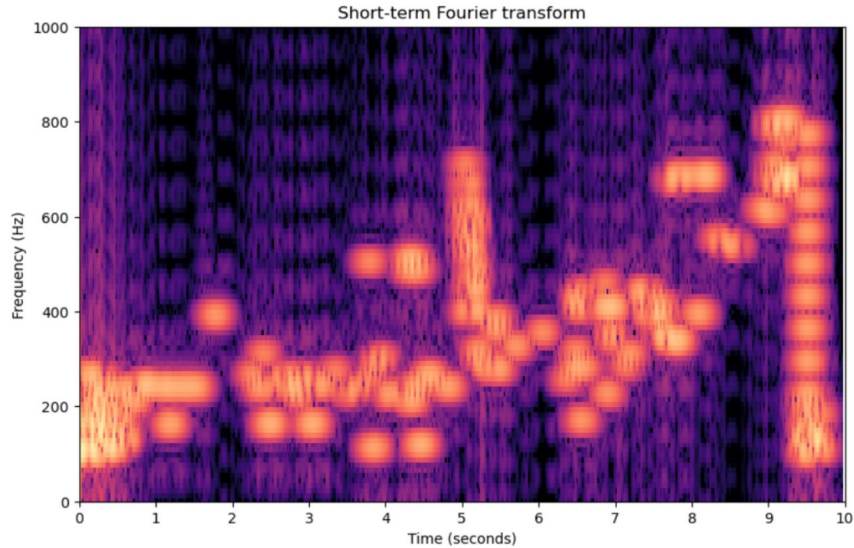


Matrice d'abondance

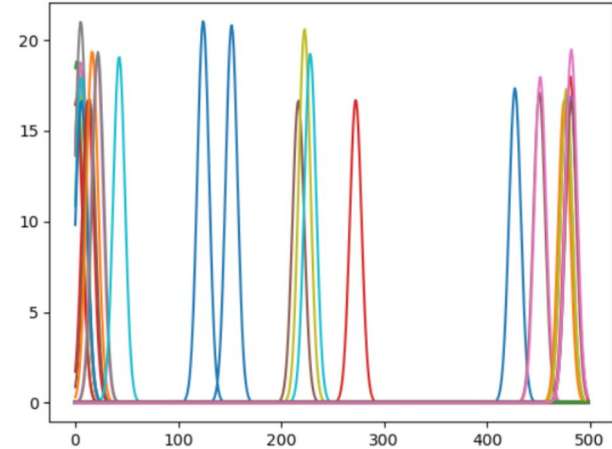
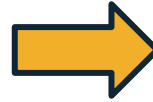
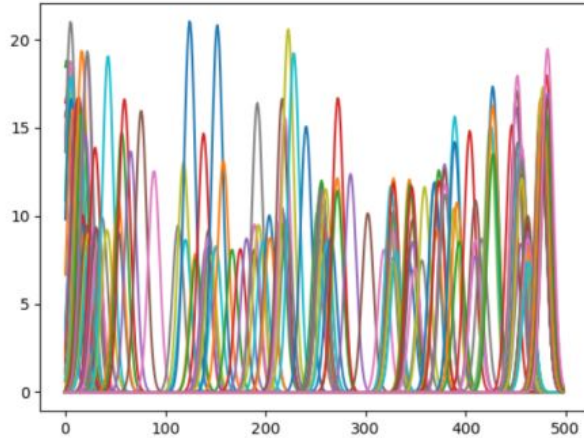
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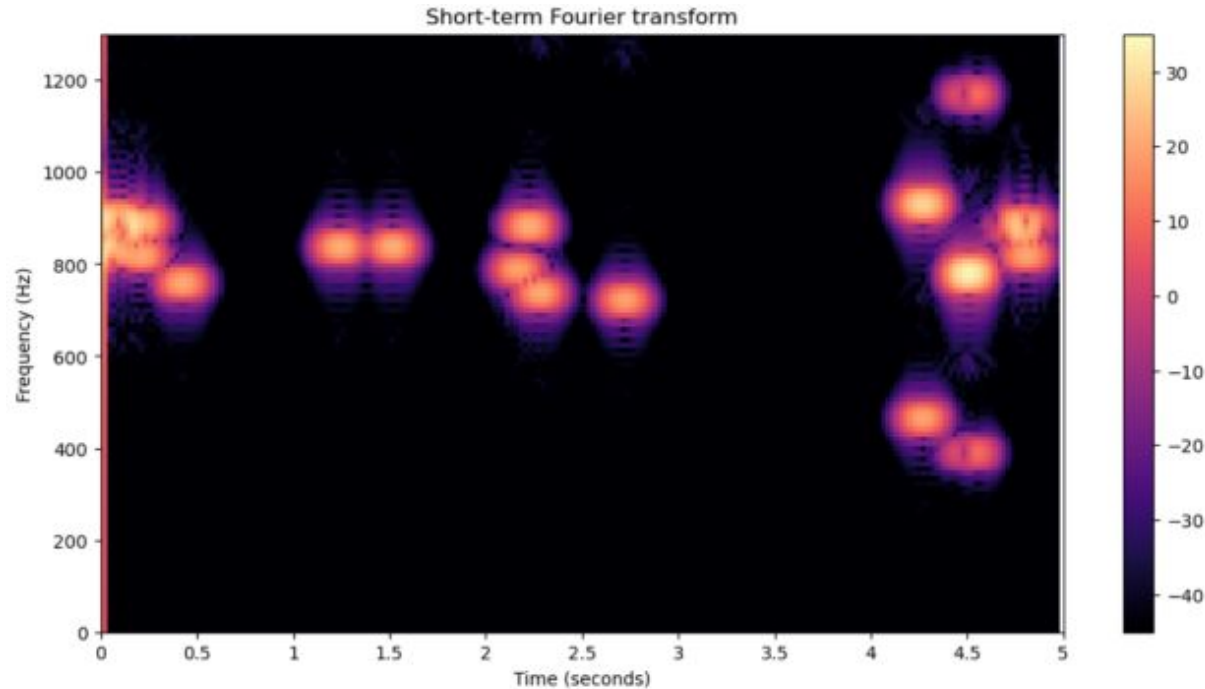
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# III. SYNTHÈSE - PREMIÈRES AMÉLIORATIONS



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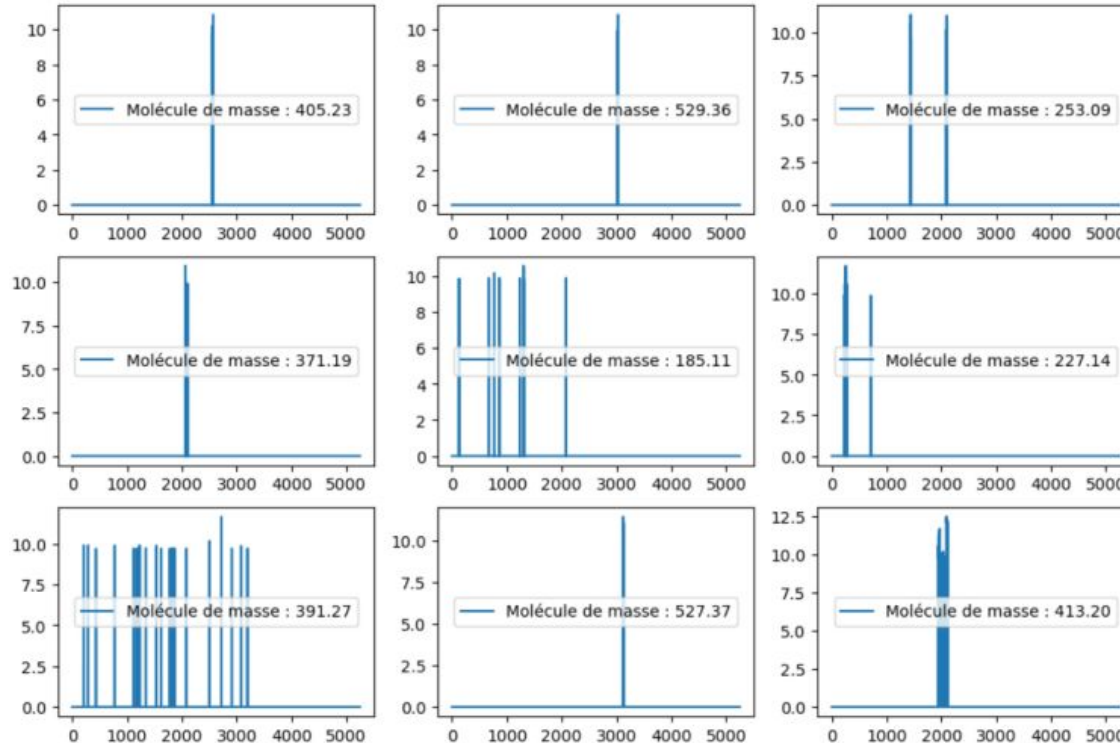


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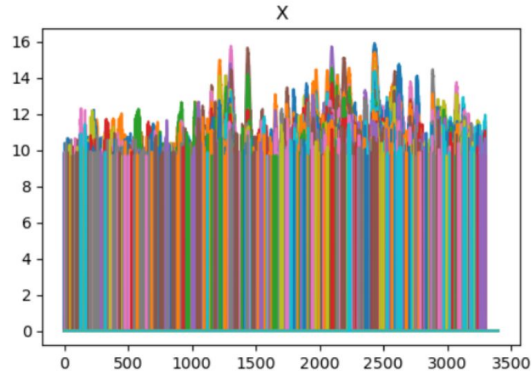
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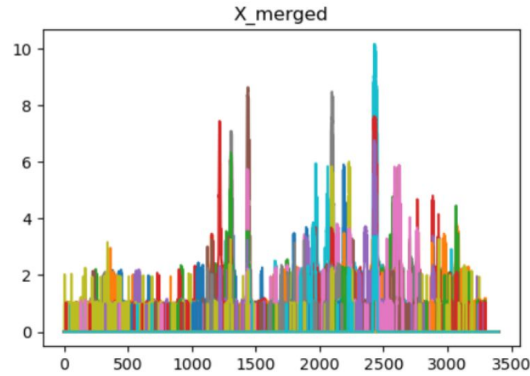
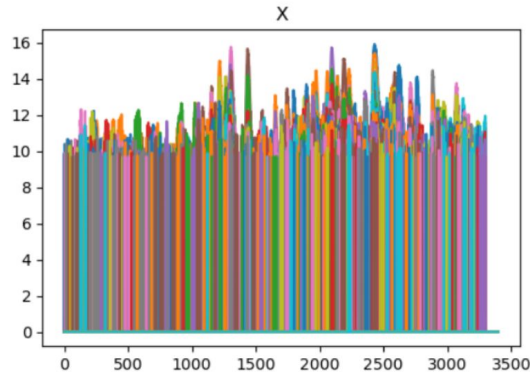
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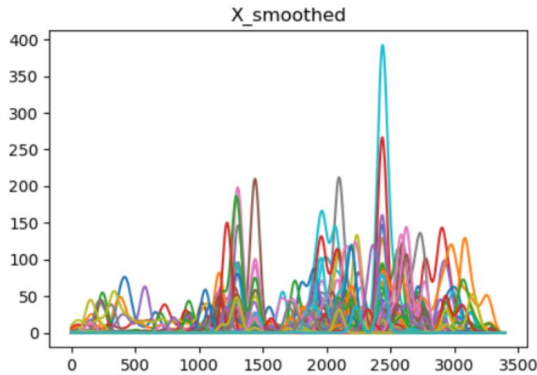
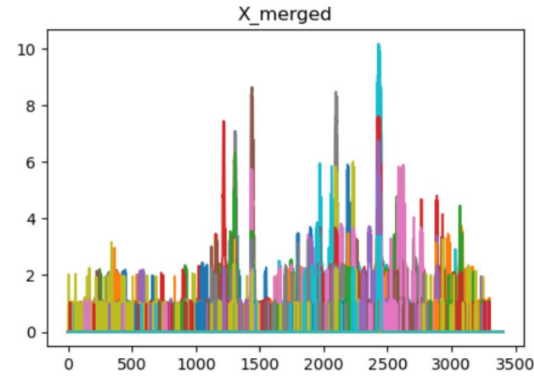
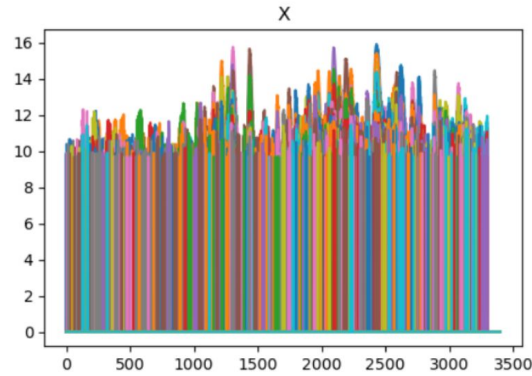
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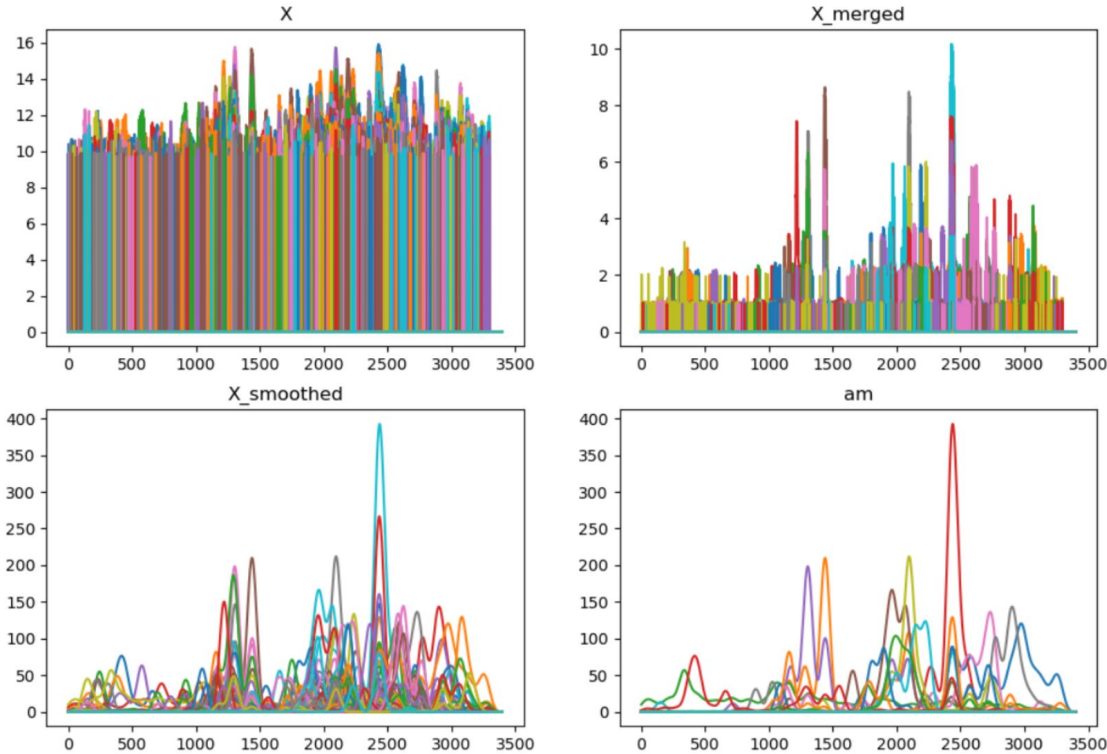
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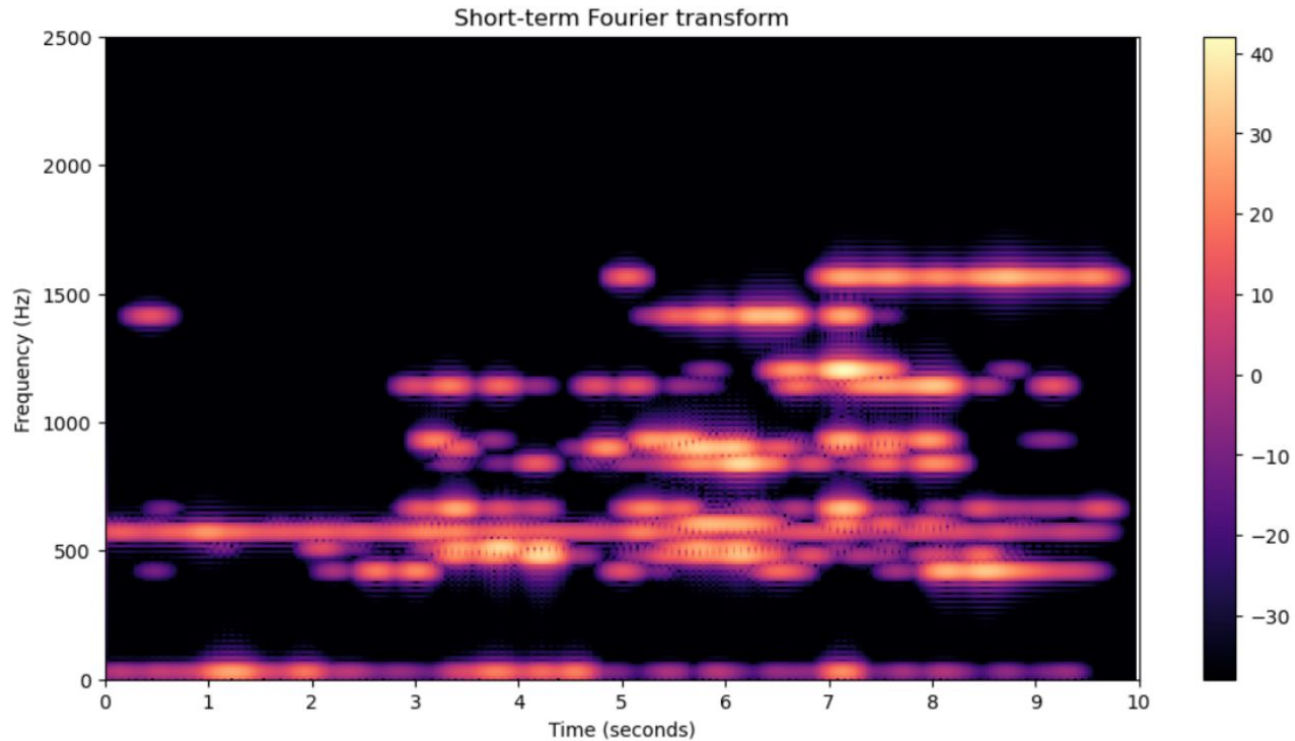
# III. SYNTHÈSE - CHANGEMENT DE FORMAT



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I. ÉTAT DE L'ART

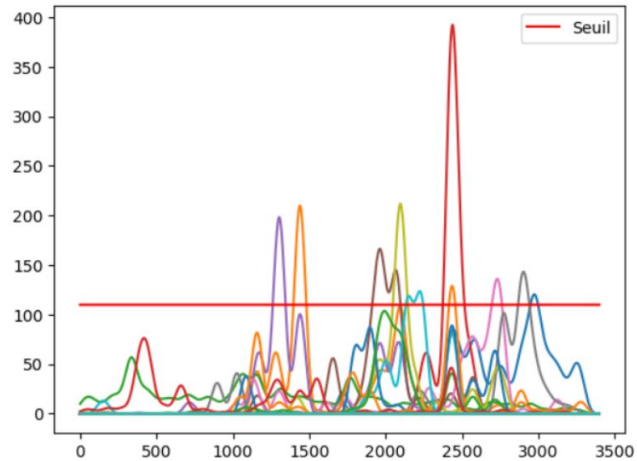
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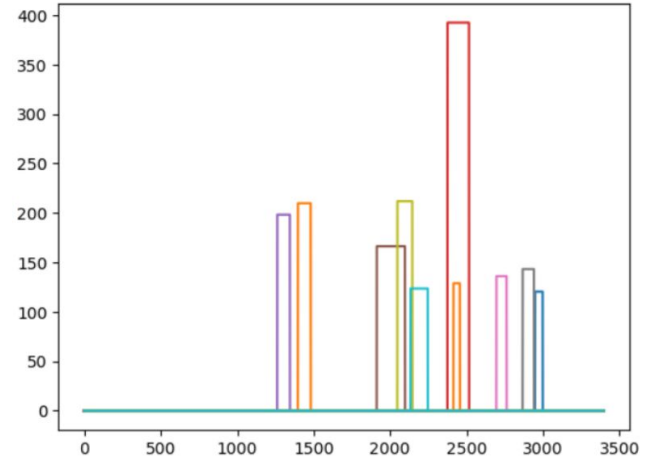
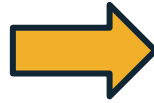
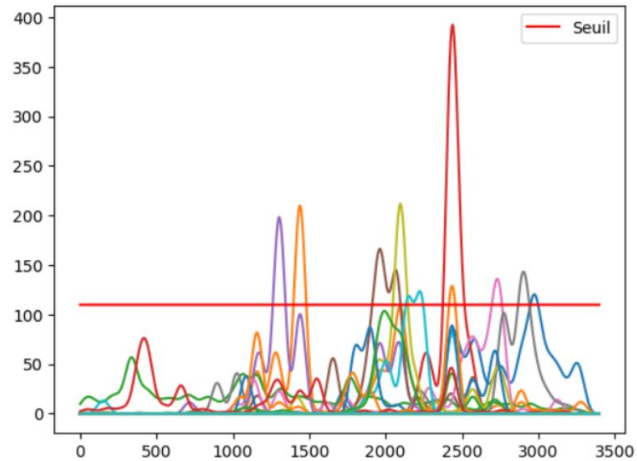
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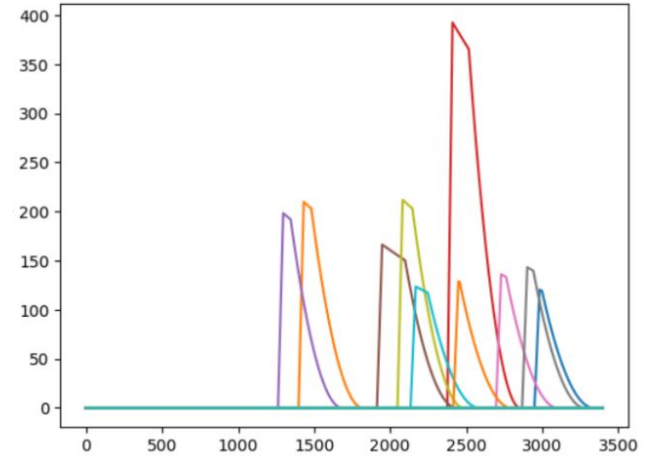
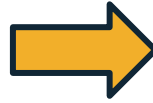
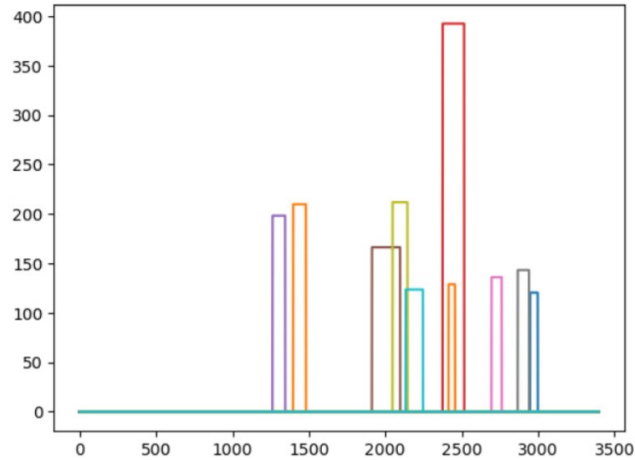




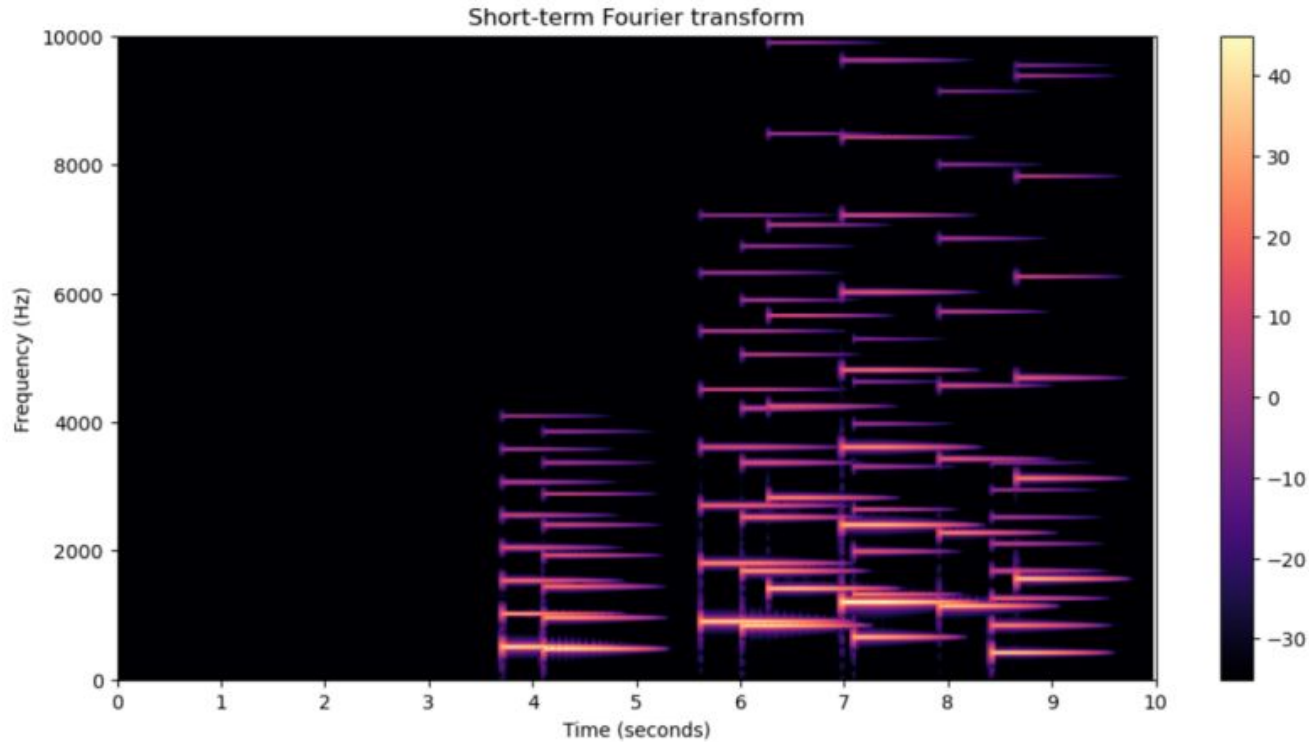
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- Si on s'en tient à l'intitulé du projet, on a bien sonifié nos données caractéristiques de micro-organismes.
- On sent bien qu'avec plus de paramétrage on peut obtenir un son meilleur que ça.

**Merci pour votre attention !**