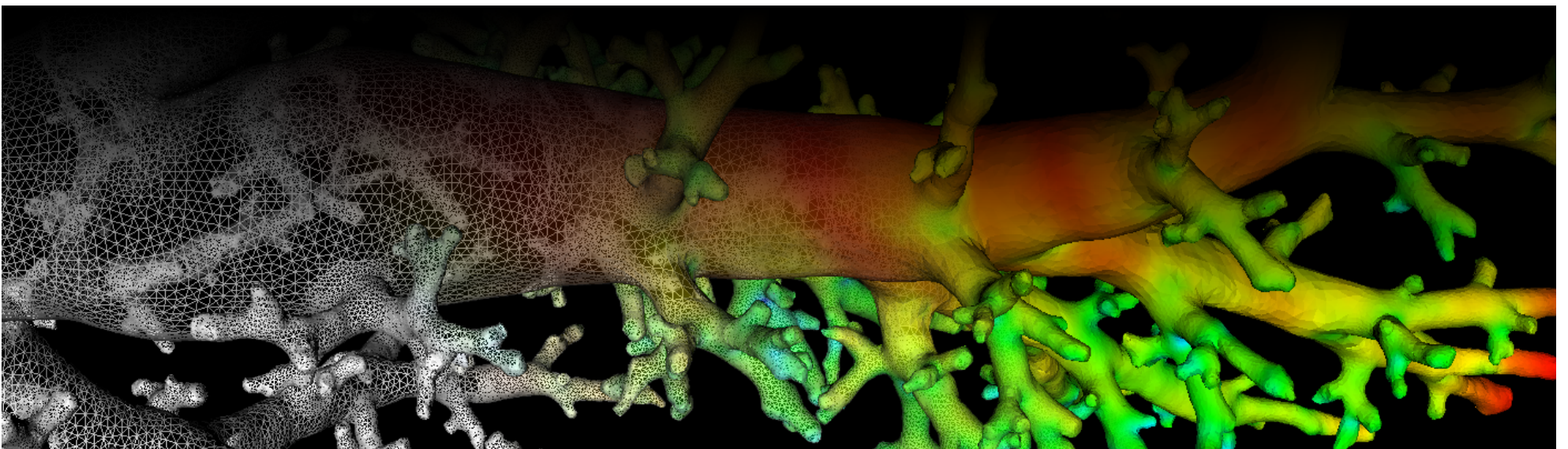


# Lung Anatomy + Particle Deposition (lapd) Mouse Archive for Modeling and Computational Toxicology



## Overview

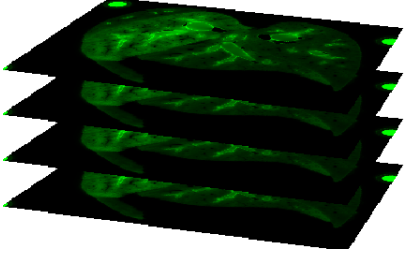
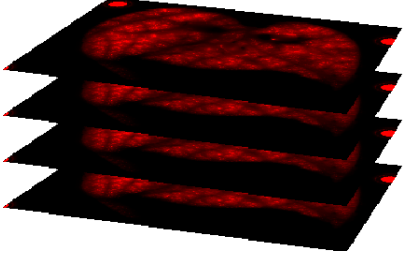
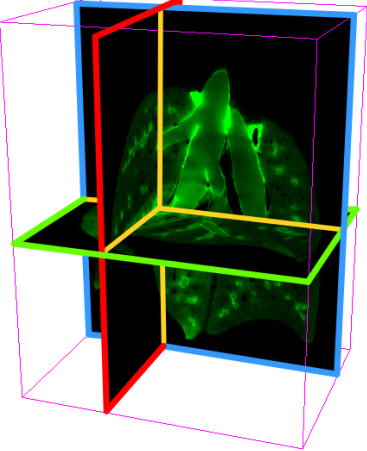
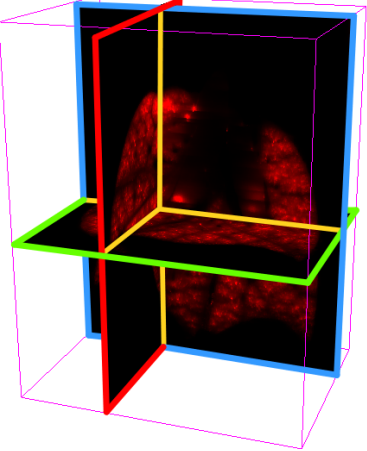
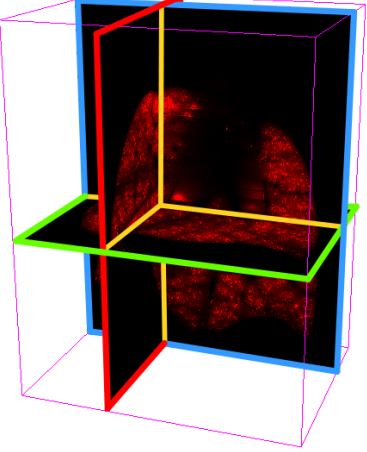
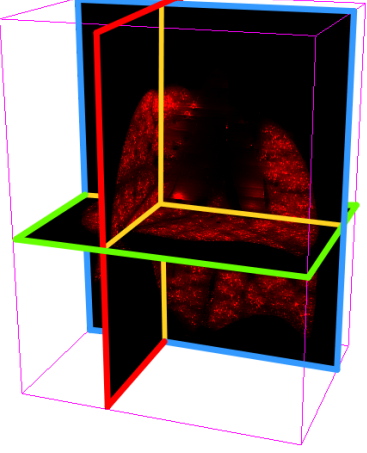
The lapdMouse archive provides for each mouse:

- [Image data](#)
  - [Airway models](#)
  - [Lung regions](#)
  - [Physiological parameters and aerosol dosing](#)
- all with site-specific particle deposition measurements

Data files follow the convention `{DatasetID}_{FileDescription}.{Extension}` and are stored in commonly utilized [file formats](#). [C++ and Python code examples](#) are provided to demonstrate how to work with and interlink these data files.

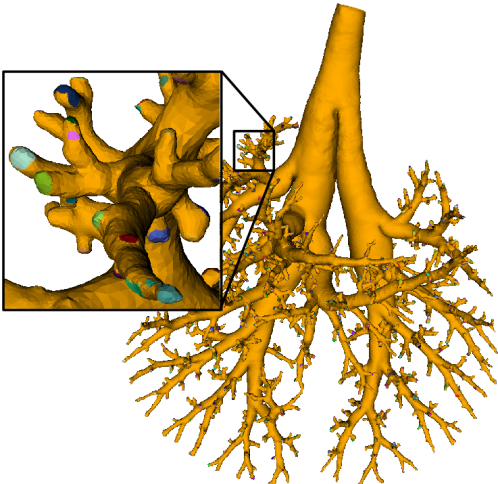
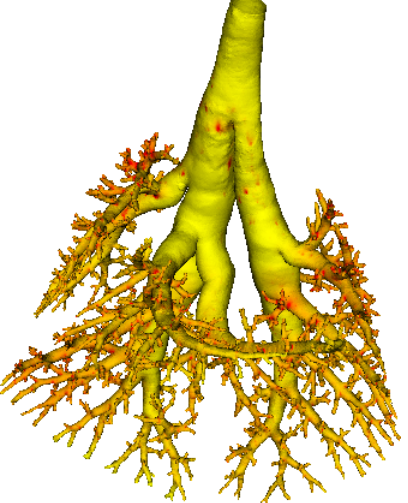
## Image Data

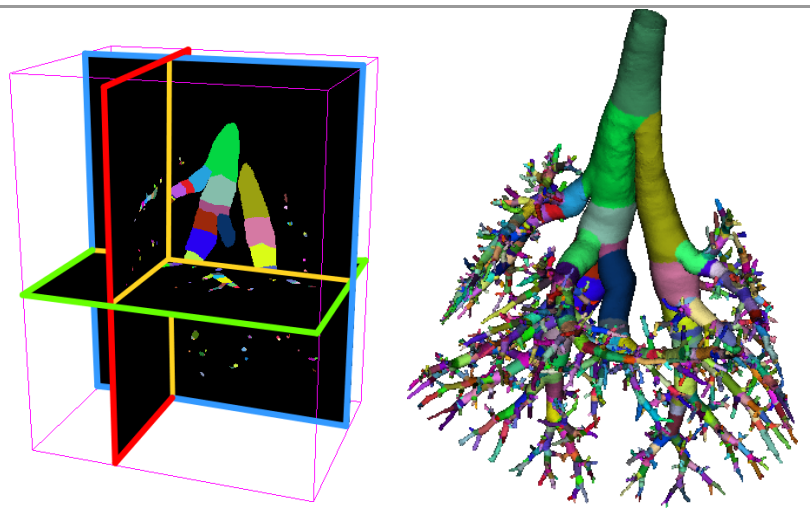
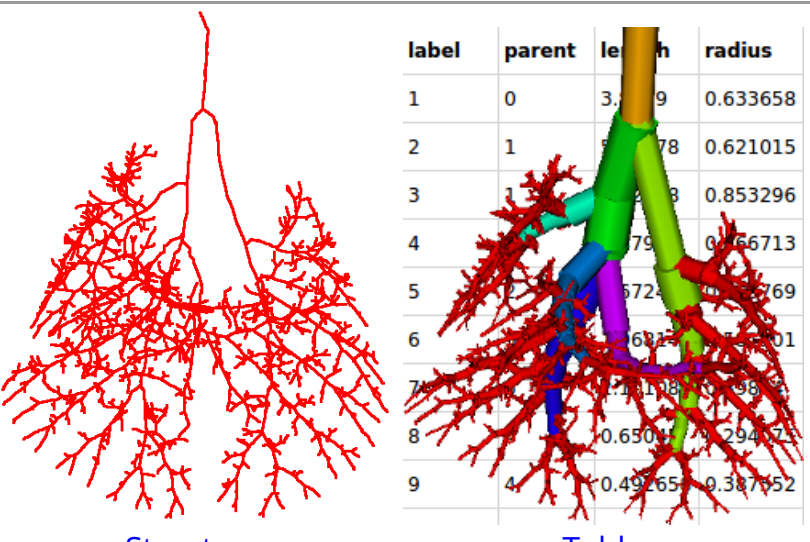
After exposure to aerosol particles (see [protocol](#)) the mice lungs are imaged with a thin-section cryomicrotome (see [more information](#)). The raw thin-section image data is cleaned and assembled into 3D image volumes showing anatomic structures and aerosol deposition. Deconvolution is applied to aerosol deposition volumes for higher resolution deposition measurements. The aerosol deposition image volumes are further processed: (a) to increase the resolution of particle measurements deconvolution is applied and (b) to allow better comparison of aerosol deposition between mice the voxel values are normalized.

Description	Anatomy	Particle Deposition
Cryomicrotome data	 <p data-bbox="680 368 1058 409">*_RawCryomicrotomeData</p>	 <p data-bbox="1400 368 1778 409">*_RawCryomicrotomeData</p>
Preprocessed volume	 <p data-bbox="594 854 1142 899">Image volume *_Autofluorescent*.mha</p>	 <p data-bbox="1373 854 1808 899">Image volume *_Aerosol*.mha</p>
Preprocessed volume after deconvolution		 <p data-bbox="1320 1344 1860 1389">Image volume *_AerosolDeconv*.mha</p>
Preprocessed volume after deconvolution and normalization		 <p data-bbox="1293 1834 1885 1878">Image volume *_AerosolNormalized*.mha</p>

## Airways

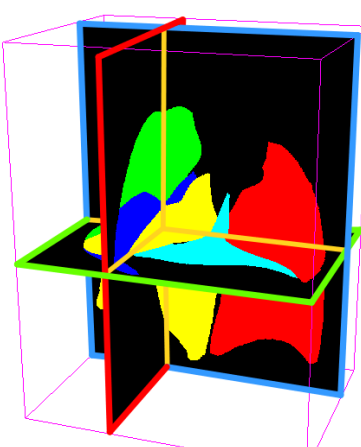
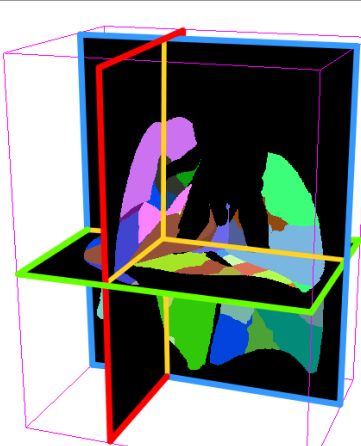
From the image data, detailed models of the airway tree with outlet regions and aerosol deposition at the airway wall are obtained. The airway tree is sectioned into hierarchially organized airway segments, for which centerline-based as well as tabular representations are provided. All airway tree representations use matching labels to refer to [corresponding airway segments](#). Major airway branches are assigned names.

Description	Anatomy	Particle Deposition
Wall with outlets	 <p data-bbox="779 2739 1142 2783">Mesh *_AirwayOutlets.vtk</p>	 <p data-bbox="1543 2733 1822 2810">Mesh *_AirwayWall Deposition.vtk</p>

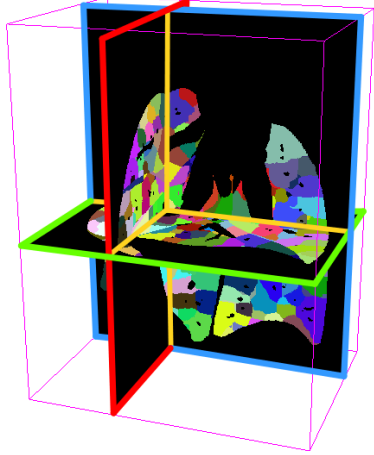
Description	Anatomy	Particle Deposition																																								
Segments	 <p>Labelmap *_AirwaySegments.nrrd</p> <p>Mesh *_AirwaySegments.vtk</p>	<table border="1"> <thead> <tr> <th>label</th> <th>area</th> <th>mean</th> <th>sigma</th> </tr> </thead> <tbody> <tr><td>1</td><td>17.2296</td><td>31.0831</td><td>194.521</td></tr> <tr><td>2</td><td>24.9678</td><td>58.1081</td><td>313.559</td></tr> <tr><td>3</td><td>24.4073</td><td>101</td><td>1008.22</td></tr> <tr><td>4</td><td>2.52</td><td>448.014</td><td></td></tr> <tr><td>5</td><td>1.22557</td><td>107.428</td><td>1021</td></tr> <tr><td>6</td><td>4.581</td><td>265.34</td><td>83.36</td></tr> <tr><td>7</td><td></td><td></td><td></td></tr> <tr><td>8</td><td>0.1249</td><td>255.1</td><td>42.3</td></tr> <tr><td>9</td><td>1.12663</td><td>218.681</td><td>146.006</td></tr> </tbody> </table> <p>Table *_AirwaySegments Deposition.csv</p>	label	area	mean	sigma	1	17.2296	31.0831	194.521	2	24.9678	58.1081	313.559	3	24.4073	101	1008.22	4	2.52	448.014		5	1.22557	107.428	1021	6	4.581	265.34	83.36	7				8	0.1249	255.1	42.3	9	1.12663	218.681	146.006
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Structural representation	 <p>Structure *_AirwayTree.meta</p> <p>Table *_AirwayTreeTable.csv</p> <table border="1"> <thead> <tr> <th>label</th> <th>parent</th> <th>length</th> <th>radius</th> </tr> </thead> <tbody> <tr><td>1</td><td>0</td><td>3.129</td><td>0.633658</td></tr> <tr><td>2</td><td>1</td><td>0.78</td><td>0.621015</td></tr> <tr><td>3</td><td>1</td><td>0.8</td><td>0.853296</td></tr> <tr><td>4</td><td>1</td><td>0.79</td><td>0.66713</td></tr> <tr><td>5</td><td>1</td><td>0.672</td><td>0.5769</td></tr> <tr><td>6</td><td>1</td><td>0.687</td><td>0.501</td></tr> <tr><td>7</td><td>1</td><td>0.21108</td><td>0.98</td></tr> <tr><td>8</td><td>4</td><td>0.650</td><td>0.294</td></tr> <tr><td>9</td><td>4</td><td>0.49265</td><td>0.387352</td></tr> </tbody> </table>	label	parent	length	radius	1	0	3.129	0.633658	2	1	0.78	0.621015	3	1	0.8	0.853296	4	1	0.79	0.66713	5	1	0.672	0.5769	6	1	0.687	0.501	7	1	0.21108	0.98	8	4	0.650	0.294	9	4	0.49265	0.387352	
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## Lung Regions

The lung is subdivided into functional anatomic units at different levels: Lobes, sublobes and near-acini structures. For each of these subdivisions the regions are represented by labelmaps, which have corresponding aerosol-deposition measurements tables.

Description	Anatomy	Particle Deposition																																																		
Lobes	 <p>Labelmap *_Lobes.nrrd</p>	<table border="1"> <thead> <tr> <th>label</th> <th>volume</th> <th>mean</th> <th>sigma</th> <th>n</th> </tr> </thead> <tbody> <tr><td>1</td><td>389.459</td><td>157.013</td><td>158.487</td><td>1</td></tr> <tr><td>2</td><td>193.899</td><td>174.354</td><td>212.184</td><td>1</td></tr> <tr><td>3</td><td>0.969</td><td>134.33</td><td>127.264</td><td>1</td></tr> <tr><td>4</td><td></td><td>162.125</td><td>187.14</td><td>1</td></tr> <tr><td>5</td><td></td><td>45.9</td><td>179.795</td><td>1</td></tr> </tbody> </table> <p>Table *_LobesDeposition.csv</p>	label	volume	mean	sigma	n	1	389.459	157.013	158.487	1	2	193.899	174.354	212.184	1	3	0.969	134.33	127.264	1	4		162.125	187.14	1	5		45.9	179.795	1																				
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Near acini	 <p data-bbox="678 587 1058 626">Labelmap *_NearAcini.nrrd</p>	<table border="1" data-bbox="1402 136 1780 581"> <thead> <tr> <th>label</th> <th>volume</th> <th>mean</th> <th>sigma</th> <th>n</th> </tr> </thead> <tbody> <tr><td>1</td><td>8.22704</td><td>135.472</td><td>199.591</td><td>9</td></tr> <tr><td>2</td><td>7.71769</td><td>144.553</td><td>113.925</td><td>1</td></tr> <tr><td>3</td><td></td><td>129.74</td><td>108.395</td><td>1</td></tr> <tr><td>4</td><td></td><td>54.181</td><td>72</td><td>1</td></tr> <tr><td>5</td><td></td><td>11.1</td><td>2</td><td>1</td></tr> <tr><td>6</td><td></td><td></td><td></td><td>1</td></tr> <tr><td>7</td><td></td><td></td><td></td><td>1</td></tr> <tr><td>8</td><td></td><td></td><td></td><td>1</td></tr> <tr><td>9</td><td>5.1</td><td></td><td>33</td><td>7</td></tr> </tbody> </table> <p data-bbox="1360 596 1818 635">Table *_NearAciniDeposition.csv</p>	label	volume	mean	sigma	n	1	8.22704	135.472	199.591	9	2	7.71769	144.553	113.925	1	3		129.74	108.395	1	4		54.181	72	1	5		11.1	2	1	6				1	7				1	8				1	9	5.1		33	7
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