

# 3D RECONSTRUCTION OF BRIGHTFIELD TOMOGRAPHY IMAGING OF MOUSE EMBRYO SKELETON

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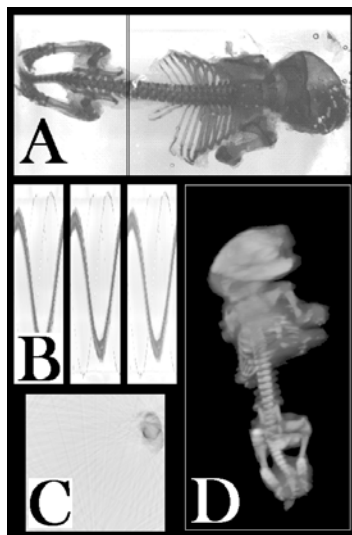
**KEY WORDS:** 3D reconstruction, brightfield imaging, tomography, inverse radon transform, mouse embryo, alizarin red and alcian blue staining, bone, cartilage, LR White embedding.

## 1. INTRODUCTION

Whole mouse embryos skeleton staining using Alizarin Red and Alcian Blue Staining is routinely used to reveal the complex 3D organization of developing bones. Conventional photography is adequate to convey global skeletal organization. However, 2D data cannot be used for angle or real length measurement of complex 3D structure, such as relative positions of limb bones. Therefore, we embedded mouse embryo into LR White resin to hold the specimen in fixed position and set it up on a rotary axis to acquire images. Images were then processed to compute a 3D reconstruction of the embryo skeleton.

## 2. METHOD

*Embryo Preparation and Data acquisition:* mouse embryos were fixed and stained with alcian blue [1] and alizarin red [2] to reveal cartilage and bone, respectively. Embryos were put in a plastic cylinder filled of LR White resin which solidifies at 60°C. The plastic was



**Figure 1** Image sample (A).  
Radon image (B). Inverse radon  
image (C). 3D reconstruction of  
the mouse embryo (D).

gently cut and the solid resin cylinder was mounted onto a rotary axis. Images were acquired each 5° using a Q-Imaging Micropublisher 3.3 RTV camera fitted to a Leica MZ16 microscope (see image sample in Figure 1A).

*Image processing for 3D reconstruction:*

All 72 images were used to construct radon images (Figure 1B) for each RGB components. The 3 images in Fig. 1B are composed of the 72 columns (see the column selection in Figure 1A). The inverse radon function using Matlab yielded the plane section shown in Figure 1C. Plane images were modified to obtain a black background for use with 3D imaging software. Volocity was used to produce the 3D image shown in Figure 1D.

## 3. CONCLUSION

Easy manipulation of the 3D reconstructed structure allows accurate measurements and correct plane selection. Moreover, this technique can be implemented to standard microscope camera system for low cost.

## 4. REFERENCES

- [1] A. G. Watson, "In toto Alcian Blue staining of the cartilaginous skeleton in mammalian embryos", *Anat. Rec.*, **187**, p.743 (1977).
- [2] G. Clark, *Staining Procedures*, p.184. (Williams & Wilkins, Baltimore, 1981).