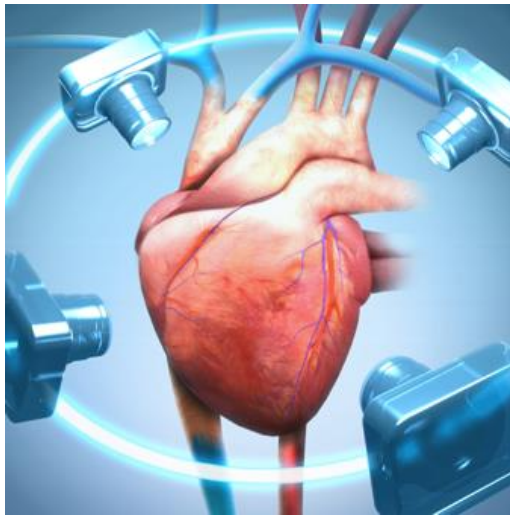


# MeAV Anatomie3Dを活用した解剖学教育



百田龍輔 Ryusuke Momota, Ph.D.

人体構成学 Human Morphology

岡山大学医学部

COI開示:パナソニック(株)との共同開発・研究・講演



医学科

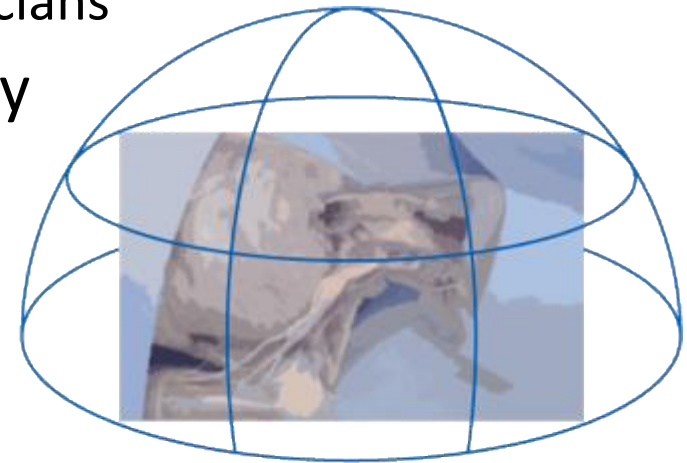
Okayama University  
Faculty of Medicine



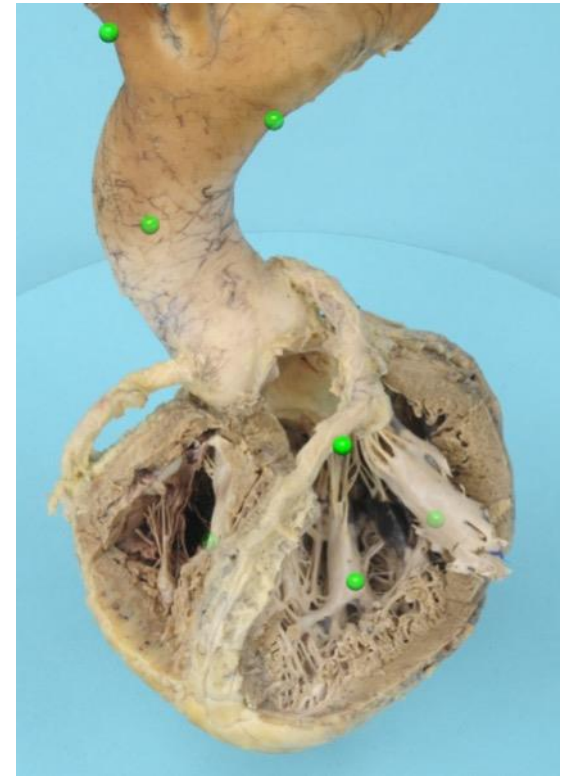
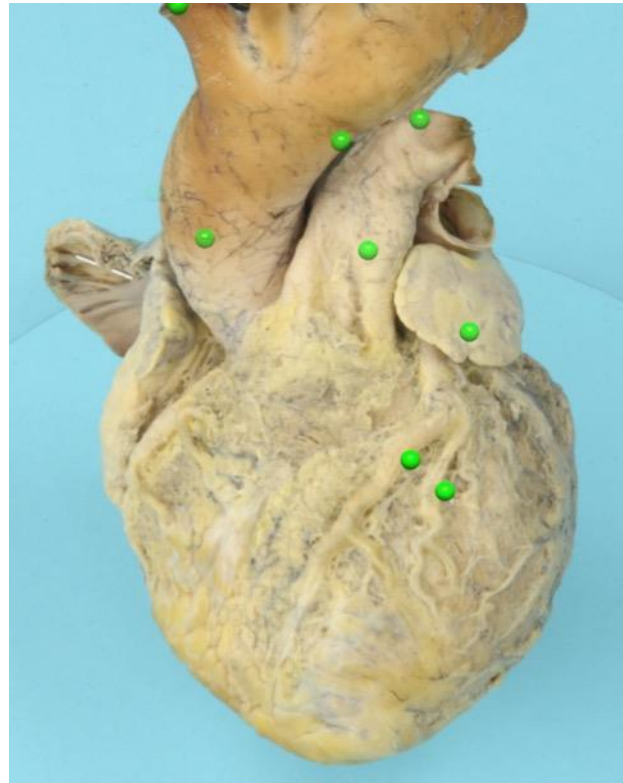
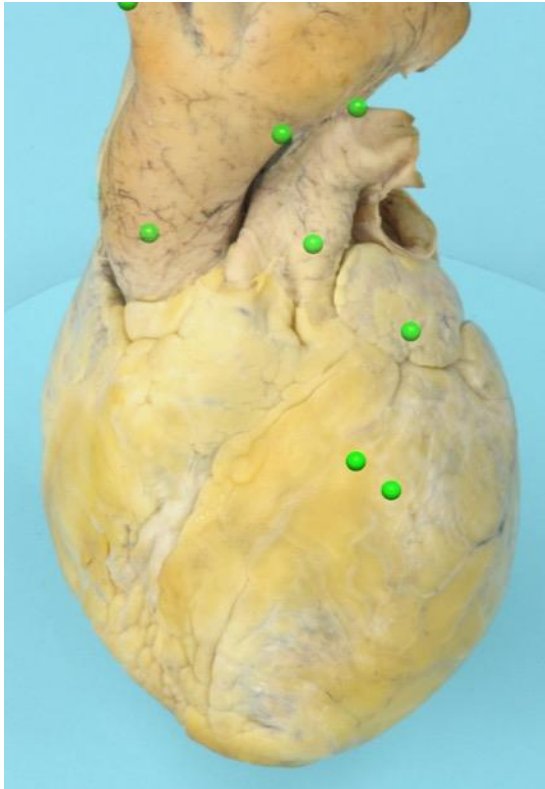
# 3D Human Body Viewer

## MeAV Anatomie Project: Collaboration with Panasonic

- Okayama Univ: Dissection
  - By certified anatomists/experienced clinicians
- Panasonic: State-of-the-Art-Technology
  - High resolution images
  - 5 or 7.5 degree
  - Images of multiple layers
    - >>> compiled to 3D images
  - Interactive interface
    - <https://panasonic.biz/cns/invc/meav-anatomie/>
- Surgical training
- Students' active-learning (But, how do you it?)



# MeAV Anatomie 3D: the heart



- Okayama Univ. x Panasonic

# MeAVを教育でどう活用するか

- これまでの利用：
  - 教員による説明
  - Moodleでのクイズ
  - 閲覧：解剖をすすめる前に確認
- 画像が中心でMeAVの機能を活用できていない！



Question 3  
Not yet answered  
Marked out of 4.00  
Flag question  
Edit question

つぎのそれぞれの名称を日本語で答えなさい。

本画像は岡山大学3D解剖プロジェクトが作成しました。(岡山大学・Panasonicのプロジェクト)

(1)

(2)

(3)

(3)

# MeAVで探してみよう:きっかけ

- 「解剖実習の手びき」とMeAVをめぐる会話
  - 学生「手びきに出ている項目がMeAVにありません」
  - 教員M「じゃあ、自分で探してみて」
  - 学生「え？」



ミクروسコピア購読を薦める  
藤田恒夫先生  
1929-2012

# MeAVで探してみよう: 準備

- MeAVにない「手びき」の太字語句の抽出
  - 手びきの太字用語(2760)
    - 「ファーター・パチニ小体、～症」などをここから除く
  - MeAVにある用語(633)
  - MeAVにない用語(1223)
    - リストのファイルを印刷し配布
- MeAVのBookmark機能の操作手順の作成
- 参加者募集(10名程度)
  - ブラックモンブラン(竹下製菓)



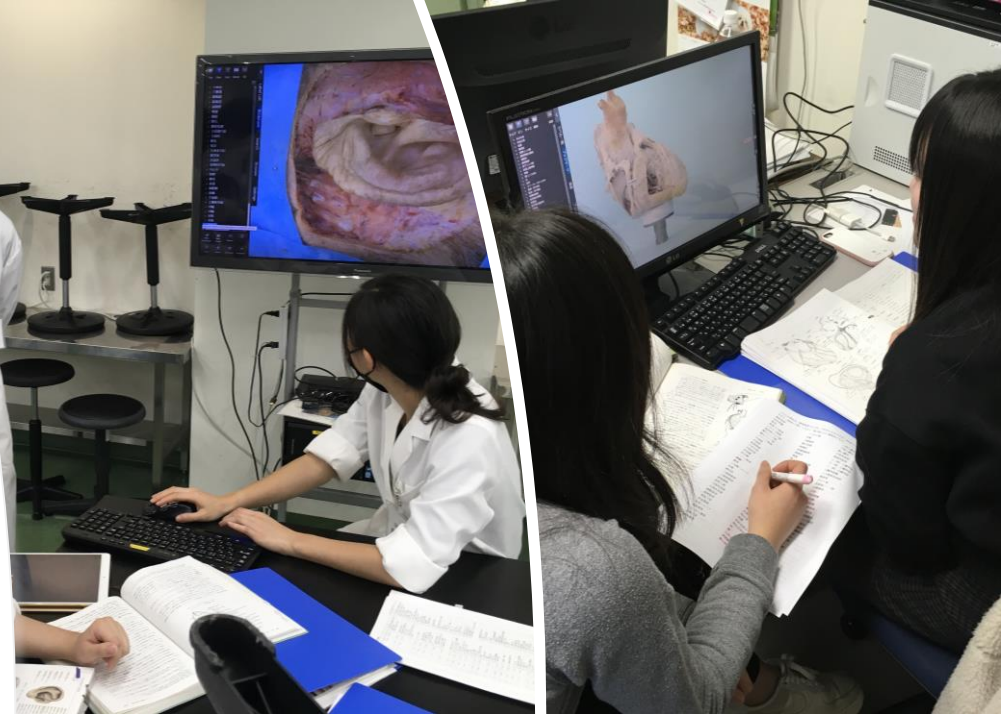
## MeAV anatomie

- General operations with mouse
  - Wheel: enlarge/shrink
  - Right click hold + wheel: change layer
  - Right click hold + mouse: move object
  - Move the object of your interest to the center and adjust to appropriate size.
- To make bookmarks
  1. Click on the "bookmark" tab.
  2. フォルダ追加 (Group番号)
  3. ブックマーク名に項目
  4. 保存



# MeAVで探してみよう： 結果

- 参加者からBookmarkを回収
- 223の新たな用語のBookmarkを得た。
  - $633 + 223 = 856$ 用語(全体の46%)
  - $1223 - 223 = 1000$ がまだ残っている。



# 実習終了後のクイズの結果

- 「手びき」の文章からの出題(右図:10問)
- 初見の英文問題(下図:14問)
- 参加者と非参加者で得点を比較

**Question 11**  
Not yet answered  
Marked out of 2.00  
Flag question  
Edit question

A 54-year-old high school teacher has been diagnosed with coronary artery disease and is going to undergo coronary bypass surgery. During the surgery, the thoracic surgeon decides to use the internal thoracic artery for one of the bypasses. Which of the following arteries gives rise to the internal thoracic artery?

Select one:

- a. Superior epigastric artery
- b. Ascending aorta
- c. Subclavian artery
- d. Axillary artery
- e. Costocervical trunk

**Question 12**  
Not yet answered  
Marked out of 2.00  
Flag question  
Edit question

A 34-year-old singer has been diagnosed with thyroid cancer and consequently has a thyroidectomy. He has been hoarse ever since the surgery 8 weeks ago. It has been suspected that a nerve was injured during the operation. Which of the following nerves is most likely damaged?

Select one:

- a. Hypoglossal nerve
- b. Glossopharyngeal nerve
- c. Internal laryngeal nerve
- d. External laryngeal nerve
- e. Recurrent laryngeal nerve

**Question 13**  
Not yet answered  
Marked out of 2.00  
Flag question  
Edit question

Each of the following statements concerning the muscles of facial expression is correct **except**

Select one:

- a. they are attached to the skin of the face
- b. they enable us to move our facial skin and change our facial expression
- c. some of them are supplied by the trigeminal nerve
- d. they lie in the subcutaneous tissue of the face
- e. they are derived from mesenchyme in the second brachial arch

**Question 14**  
Not yet answered  
Marked out of 2.00  
Flag question  
Edit question

Each of the following statements concerning the trigeminal nerve is correct **except**

Select one:

- a. it divides into two nerves, maxillary and mandibular
- b. it is the major sensory nerve of the head
- c. its divisions supply clearly defined areas of facial skin
- d. it is sensory to the face, temple, and anterior scalp
- e. it is motor to the muscles of mastication

**Question 1**  
Not yet answered  
Marked out of 1.00  
Flag question  
Edit question

表層の筋から順番に番号をつけなさい。

僧帽筋 Choose... ▾

頭半棘筋 Choose... ▾

頭板状筋 Choose... ▾

**Question 2**  
Not yet answered  
Marked out of 1.00  
Flag question  
Edit question

次の記述は正しいか、否か？

「腸肋筋の内側に最長筋が見られる。」

Select one:

- True
- False

**Question 3**  
Not yet answered  
Marked out of 1.00  
Flag question  
Edit question

筋皮神経が貫く筋はどれ？

Select one:

- a. 上腕三頭筋
- b. 上腕筋
- c. 三角筋
- d. 烏口腕筋

**Question 4**  
Not yet answered  
Marked out of 1.00  
Flag question  
Edit question

総胆管は網嚢孔の後ろに位置する。

Select one:

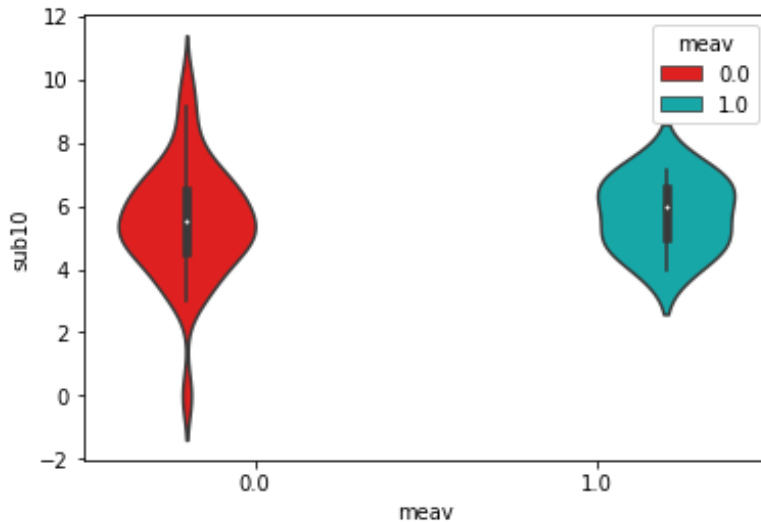
- True
- False



# クイズ得点の比較

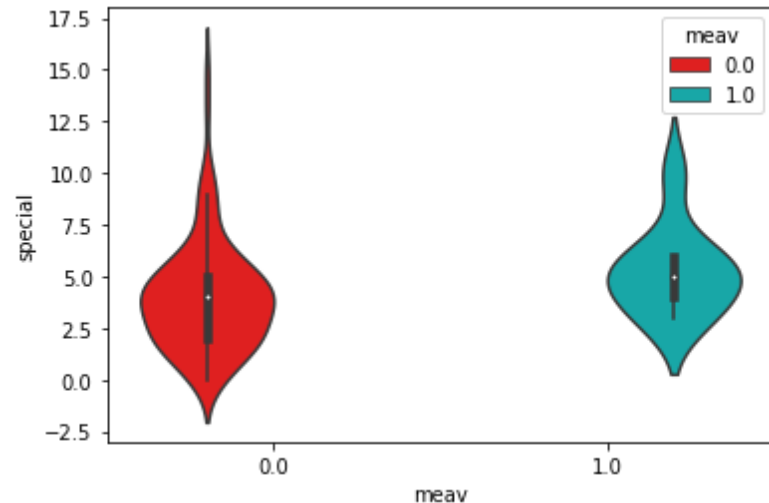
## 「手びき」からの出題

- 非参加群 : 5.52
- 参加群 : 5.73
- $P = 0.34$



## 初見の英文問題

- 非参加群 : 3.97
- 参加群 : 5.22
- $P = 0.03$



参加群に極端に悪い点の学生はいなかった。  
初見の英文問題の点は何故か良かった。  
>>> 積極性、物怖じしない？

# MeAVの可能性と今後の展望

- 3D解剖ビューワーとしての利用
- 見出しの項目をオフにすることで実習と同様に自分で探すことができる。
- Bookmark機能を用いることで学生がどのように理解し見ているかがわかる。
  - Cloudベースにしたら良いと思う。
    - ログ
    - レビューをシェア
    - ユーザーを貢献度に応じてランキング
    - ユーザーのフォロー
    - Wikipediaなど他のデータベースとの相互リンク などなど
    - 購読型の課金：学生には安い料金で

# 解剖用語ネットワークによる 他のデータベースとの関係

- <https://github.com/ryusukemomota/nanatex>
- <http://rdcu.be/urNZ>

- 統合データベースプロジェクト
- BodyParts3D
- <http://lifesciencedb.jp/bp3d/>

## Network of anatomical texts (NANA Tex), an open-source project for visualizing the interaction between anatomical terms

Ryusuke Momota<sup>1</sup> & Aiji Ohtsuka<sup>1</sup>

Received: 5 April 2017 / Accepted: 16 July 2017  
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**Abstract** Anatomy is the science and art of understanding the structure of the body and its components in relation to the functions of the whole-body system. Medicine is based on a deep understanding of anatomy, but quite a few introductory-level learners are overwhelmed by the sheer amount of anatomical terminology that must be understood, so they regard anatomy as a dull and dense subject. To help them learn anatomical terms in a more contextual way, we started a new open-source project, the Network of Anatomical Texts (NANA Tex), which visualizes relationships of body components by integrating text-based anatomical information using Cytoscape, a network visualization software platform. Here, we present a network of bones and muscles produced from literature descriptions. As this network is primarily text-based and does not require any programming knowledge, it is easy to implement new functions or provide extra information by making changes to the original text files. To facilitate collaborations, we deposited the source code files for the network into the GitHub repository (<https://github.com/ryusukemomota/nanatex>) so that anybody can participate in the evolution of the network and use it for their own non-profit purposes. This project should help not only introductory-level learners but also professional medical practitioners, who could use it as a quick reference.

**Electronic supplementary material** The online version of this article ([doi:10.1007/s12283-017-0410-1](https://doi.org/10.1007/s12283-017-0410-1)) contains supplementary material, which is available to authorized users.

© Ryusuke Momota  
momota@kyama-u.ac.jp

<sup>1</sup> Human Morphology, Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, 2-5-1, Shikata-cho, Kita, Okayama 700-8558, Japan

Published online: 24 July 2017

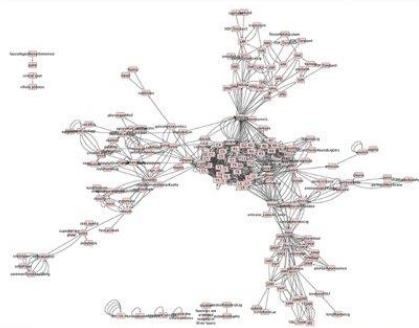


**Keywords** Anatomical terms · Cytoscape · GitHub · Network analysis · Open source

### Introduction

Network analysis is an area of mathematics which examines the structure of the relationships and complex interactions among multiple components. Such analyses have been used in many fields, such as the social sciences, and have often revealed unexpected aspects of the issues and helped developing new strategies (Maruyama et al. 2016). In biology, network analyses of molecular interactions have been carried out to find molecules or pathways that potentially be exploited for pharmaceutical purposes (Chen et al. 2016; Zhang et al. 2016). Anatomical network analysis (ANA) has recently been introduced for use in gross anatomical studies. The resulting detailed regional anatomical observations have demonstrated the modularity of the musculoskeletal system and have allowed the morphological changes that have occurred over the course of evolution to be elucidated, as well as the morphological changes associated with a particular pathological condition (Izawa-Alava et al. 2013; Diego et al. 2015).

Due to the availability of advanced information technology, text-based anatomical information has become abundant. Indeed, there is so much of this information that it can overwhelm introductory-level learners of anatomy. Therefore, we attempted to integrate information on the bone and muscular interactions of the human body that is available in literature descriptions using Cytoscape, a network visualization software platform. Cytoscape was originally created to visualize biological molecular interactions, but it has since evolved to become a platform for performing any network analysis due to its user-friendly interface and



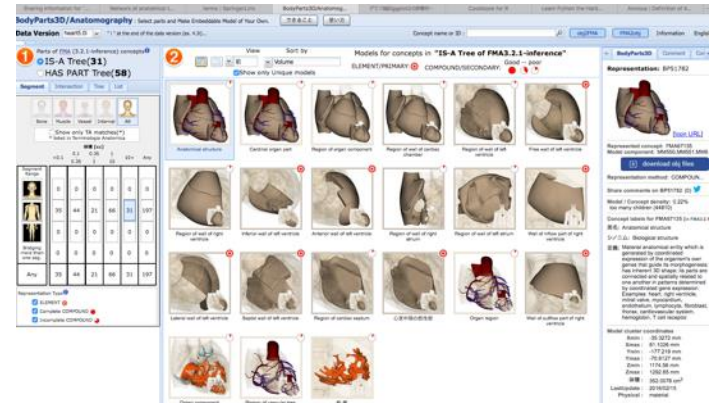
**Fig. 1** An overview of the network displayed in the “Organic” style of Jilun Layman. Muscle origins are indicated by directed arrows; body components with muscle attachment sites, mainly contained by

the ability to extend its functionality with many apps (Oho 2016; Bader et al. 2017; Shannon et al. 2003). In our analysis, we obtained a network consisting of 196 nodes with 1048 muscular interactions. Important components in the network were identified. Combined with the functions of Cytoscape, this network can be employed as a very useful learning resource and a quick graphical reference by simply adding more text information. To encourage contributions to this network and thus promote its development, we deposited the relevant files in the GitHub repository (<https://github.com/ryusukemomota/nanatex>).

### Materials and methods

We found that the tables in the webpages of the University of Michigan Medical School were a very good resource, as they were packed with succinctly summarized anatomical

information (<http://www.med.umich.edu/rlc/coursepages/ml/teachery2010/html/anatomyabc/>). Therefore, we obtained the permission of Dr. Thomas Gest (Texas Tech University Health Sciences Center, Paul L. Foster School of Medicine) to use that information in this project. To prepare the data set, the tabulated data were extracted from the HTML files and transferred to Excel 2016 (Microsoft) for further manipulation. The “Origin” and “Insertion” columns were duplicated and renamed to create “Origin1” and “Insertion1” nodes, respectively. We used a simplified model in which each body part is assumed to represent a single node, so we extracted names of body parts and removed detailed descriptions of muscle attachment sites. We then unified terms by removing synonyms (e.g., “C1 for atlas” and “C2 for axis”). For muscles with multiple origin/insertions such as “rotatores” or “splenius”, we visually confirmed multiple “origin-insertion” relationships using a MeVis Anatomie 3D system (Panaoson



# 御清聴有り難う ございました。

アンケートにご協力ください。



・ご意見・ご感想をお聞かせ下さい。

岡山大学 百田龍輔先生  
[momo@okayama-u.ac.jp](mailto:momo@okayama-u.ac.jp)

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[f.cess-info@ml.jp.panasonic.com](mailto:f.cess-info@ml.jp.panasonic.com)

・MeAV Anatomie 3Dの商品サイトはこちら  
<https://panasonic.biz/cns/invc/meav-anatomie/>

