



OpenGALEN

# Foundational Anatomy Ontologies

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[www.opengalen.org](http://www.opengalen.org)

[www.cs.man.ac.uk/mig](http://www.cs.man.ac.uk/mig)



# Anatomy matters

Most models of most biomedical subdomains must include an ontology of anatomy.

Or reference an external one.



# But anatomy is very big, so...

Let us build a single, free-standing authoritative ontology of anatomy that everybody can reference

(Rather than building their own)



# OK, but....

What problems arise when a foundational anatomy ontology is actually used as the foundation to something ?



# Your end users are perverse: Childhood Exanthems

- First Disease : Measles (Paramyxovirus)
- Second Disease : Scarlet Fever (Streptococcal)
- Third Disease : Rubella (Rubivirus)
- ~~• Fourth Disease : *Scarlatina*, Duke's Disease (?)~~
- Fifth Disease : Erythema Infectiosum (Parvovirus)
- Sixth Disease : Rosela Infantum (Herpes Virus-6)



# Anatomy and Pathology

*A lesion of the part is a lesion of the whole*



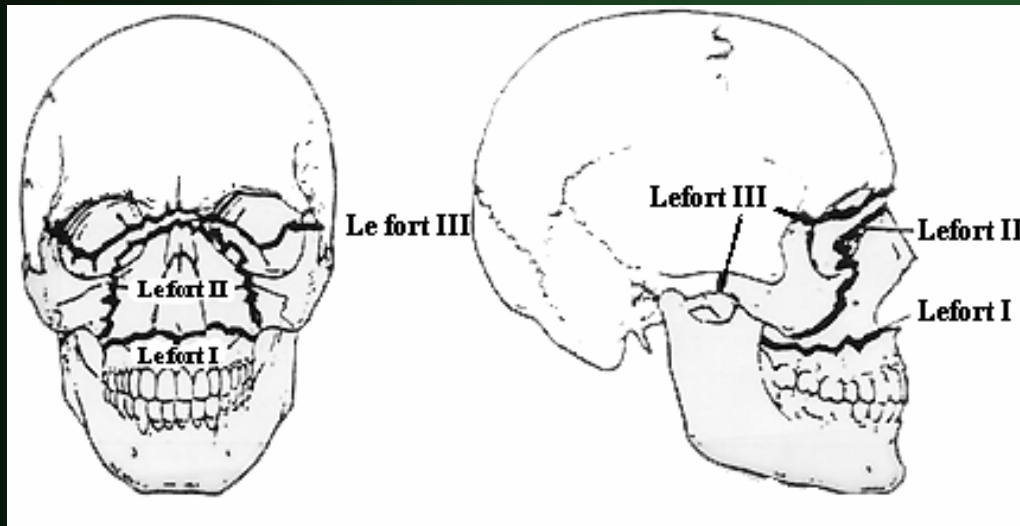
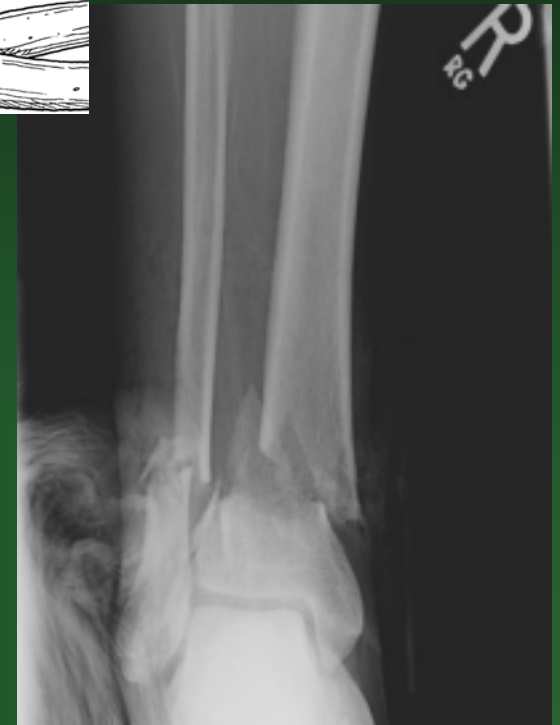
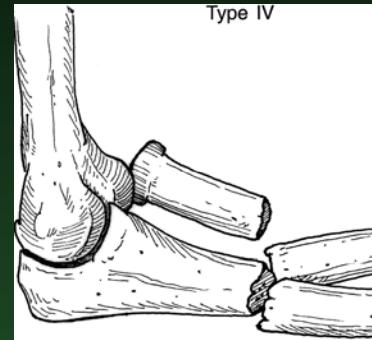
# Hand, Foot & Mouth disease

- Common, harmless, transient ulcerating rash in children simultaneously affecting
  - Oral mucous membranes
  - Palms of hands
  - Soles of feet
- Caused by coxsackievirus A16
- One rash, or several rashes ?
  - One rash – where ? Which body part ?
  - More than one rash - antiintuitive
- See also chemical burns



# The location of bony fractures

- How many locations can a bony fracture have ?
- If one, then which body part are these fractures in ?



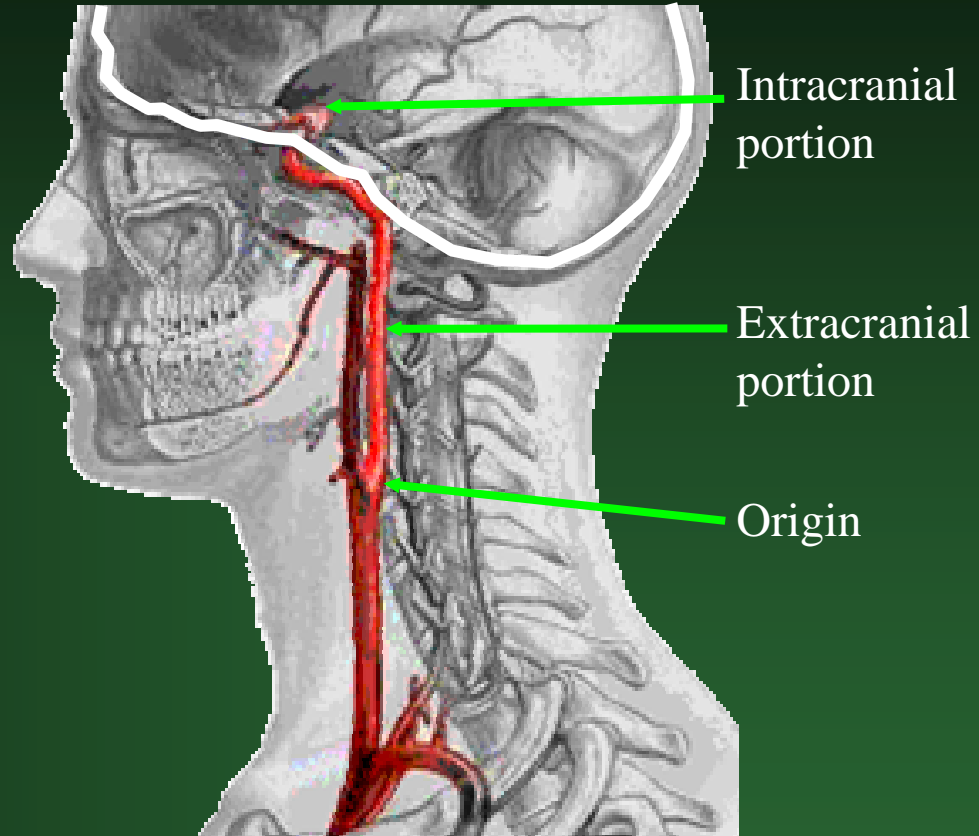
# Anatomy and Surgery

*A lesion of the part is a lesion of the whole*



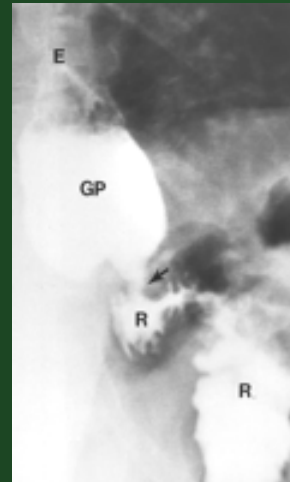
# Where is the Internal Carotid Artery ?

- Anatomy
  - Origin in neck
  - Enters the skull
  - Supplies the brain
- Both parts prone to
  - Aneurysms
  - Stenosis
- But clinically very different
  - Consequences
  - Treatments



# Anastomoses

- ‘abnormal connection between two normally separate spaces or structures’
- A structure in its own right
  - Site of leakage, stricture, infection, dehiscence, prolapse
- Is it part of the structures it joins ?



# Anatomy and Surgery

*A lesion of the part is a lesion of the whole*



# Surgery on components

- Repair of anterior cruciate ← knee repair because...?
- Resection of colon ← intestinal surgery because...?
- Pulmonary lobectomy ← excision of lung because...?
- Amputation of foot ~~↔~~ amputation of leg because...?



# Anatomy and Physiology

*A function of the part is a function of the whole*



# The Pancreas

## [Pancreas: Introduction and Index](#)

... normal blood concentrations of glucose. Core concepts in physiology of the **exocrine pancreas** are presented as the following topics: ...

[arbl.cvmb.colostate.edu/hbooks/pathphys/digestion/pancreas/](http://arbl.cvmb.colostate.edu/hbooks/pathphys/digestion/pancreas/) - 3k - [Cached](#) - [Similar pages](#)

## [Basic Histology -- Exocrine Pancreas](#)

Basic Histology -- **Exocrine Pancreas** Next Home Back

**Exocrine** pancreatic ducts are easy to see, as tubes of cuboidal epithelium with obvious lumens. ...

[www.pathguy.com/histo/075.htm](http://www.pathguy.com/histo/075.htm) - 3k - [Cached](#) - [Similar pages](#)

## [NIH Guide: DEVELOPMENT OF THE GUT, LIVER AND EXOCRINE PANCREAS](#)

DEVELOPMENT OF THE GUT, LIVER AND EXOCRINE PANCREAS Release Date: November 14, 2000 RFA NUMBER: DK-01-023 National Institute of Diabetes and Digestive and Kidney Diseases

[grants.nih.gov/grants/guide/rfa-files/RFA-DK-01-023.html](http://grants.nih.gov/grants/guide/rfa-files/RFA-DK-01-023.html) - 35k - [Cached](#) - [Similar pages](#)

## [Merck Veterinary Manual](#)

The Merck Veterinary Manual (MVM) has served veterinarians and other animal health professionals as a concise and reliable animal health reference for over 45 years.

[www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/25400.htm](http://www.merckvetmanual.com/mvm/index.jsp?cfile=htm/bc/25400.htm) - 4k - [Cached](#) - [Similar pages](#)

## [Merck Vet. Edition - The Exocrine Pancreas: Introduction](#)

Print this page. The **Exocrine Pancreas: Introduction**. The **pancreas** has both **exocrine** and endocrine glandular functions. The **exocrine** ...

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## [Karger Publishers](#)

Genetic Disorders of the **Exocrine Pancreas**. An Overview and Update. ... Genetic Disorders of the **Exocrine Pancreas**. An Overview and Update. ...

[content.karger.com/ProdukteDB/produkte.asp?](http://content.karger.com/ProdukteDB/produkte.asp?)

Sponsored Links

## [Pancreatitis Treatments](#)

Latest treatment information for pancreatitis is available at [www.medifocus.com](http://www.medifocus.com).

[See your medical professional here...](#)

## [Endocrine Pancreas](#)

The **Endocrine Pancreas: Introduction and Index**. ... Core information on the **endocrine pancreas** and pancreatic hormones is presented in the following topics: ...

[arbl.cvmb.colostate.edu/hbooks/pathphys/endocrine/pancreas/](http://arbl.cvmb.colostate.edu/hbooks/pathphys/endocrine/pancreas/) - 4k - [Cached](#) - [Similar pages](#)

## [Functional Anatomy of the Endocrine Pancreas](#)

Functional Anatomy of the **Endocrine Pancreas**. ... The **endocrine pancreas** refers to those cells within the **pancreas** that synthesize and secrete hormones. ...

[arbl.cvmb.colostate.edu/hbooks/pathphys/endocrine/pancreas/anatomy.html](http://arbl.cvmb.colostate.edu/hbooks/pathphys/endocrine/pancreas/anatomy.html) - 4k - [Cached](#) - [Similar pages](#)

[ [More results from arbl.cvmb.colostate.edu](#) ]

## [Pancreas Endocrine Tumors: Insulin, Glucagon, Diabetes, and Others](#)

... The hormone function of the **pancreas** is the emphasis of this portion of **Endocrine Web** ~ this is referred to as the **Endocrine Pancreas**. ... The **Endocrine Pancreas**. ...

[www.endocrineweb.com/pancreas.html](http://www.endocrineweb.com/pancreas.html) - 15k - [Cached](#) - [Similar pages](#)

## [ENDOCRINE PANCREAS](#)

**ENDOCRINE PANCREAS**. ... The **pancreas** lies inferior to the stomach, in a bend of the duodenum. It is both an **endocrine** and an exocrine gland. ...

[mcb.berkeley.edu/courses/mcb135e/pancreas.html](http://mcb.berkeley.edu/courses/mcb135e/pancreas.html) - 8k - [Cached](#) - [Similar pages](#)

## [NIH Guide: DEVELOPMENT OF THE ENDOCRINE PANCREAS](#)

DEVELOPMENT OF THE **ENDOCRINE PANCREAS** RELEASE DATE: August 30, 2002 PA-02-161 EXPIRATION DATE: After October 1, 2005, unless reissued. ...

[grants.nih.gov/grants/guide/pa-files/PA-02-161.html](http://grants.nih.gov/grants/guide/pa-files/PA-02-161.html) - 32k - [Cached](#) - [Similar pages](#)

## [EPConDB | Welcome To EPConDB](#)

... quickly with these searches. All searches consider only genes that contain at least one EST from an **endocrine pancreas** library. ...

[www.cbil.upenn.edu/EPConDB/](http://www.cbil.upenn.edu/EPConDB/) - 43k - [Cached](#) - [Similar pages](#)

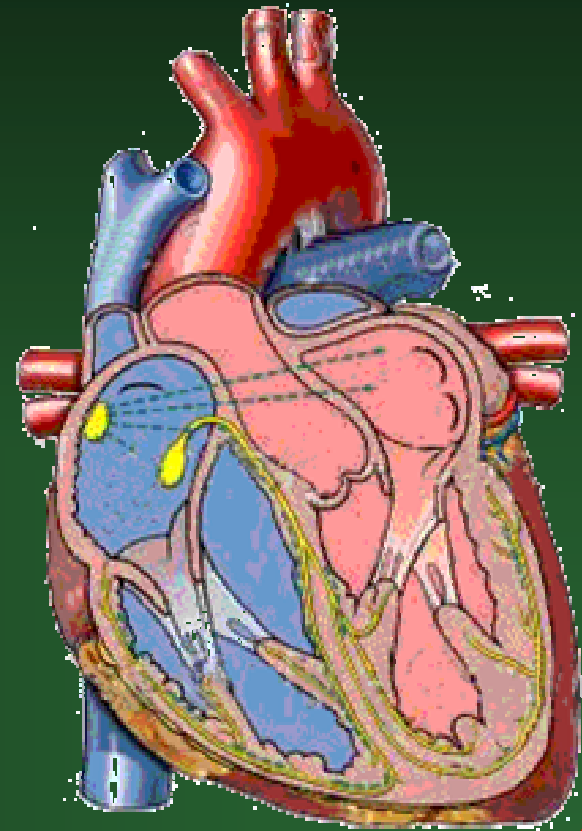
## [Islet Cell Carcinoma \(Endocrine Pancreas\)](#)

Islet Cell Carcinoma (**Endocrine Pancreas**). ... Cancer of the **endocrine pancreas** includes a highly treatable and often curable collection of tumors. ...

[www.meb.uni-bonn.de/cancer.gov/CDR0000062794.html](http://www.meb.uni-bonn.de/cancer.gov/CDR0000062794.html) - 30k - [Cached](#) - [Similar pages](#)

# The right bundle branch & The interventricular septum

- Cardiac conduction system divides into two branches
  - Left and right bundles
- Both contained within the interventricular septum
- If both bundles are part of septum, and septum is part of both ventricles...
- ..then a lesion on the right bundle is a kind of lesion of the left ventricle ?



# Conclusion

- Anatomy really *is* foundational
- Generic or ‘pure’ approaches may not integrate
  - Too much religious adherence to ontological principles will alienate your users
  - Mechanisms to coerce clinical view into ‘correct’ view introduce complexity
- To be sufficiently general to support multiple applications may be too general to (directly) support one
- A foundation is only as useful as the house you can build on it

