

Approaches to Project Execution

Project »Human Skeletal Collections«

Albert-Ludwigs-Universität Freiburg



**UNI
FREIBURG**

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Workshop »Digital Standards for Research Data from Human Skeletal Collections«,

7 October 2016

Previous Work and Experiences

- Global History of Health Project
- Mushroom Hunters' Club
- Traces of Armed Conflict

Requirements for a Data Standard and Accompanying Software

- Considerations Concerning the Data Standard
- Considerations Concerning the Database Application

Global History of Health Project



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GLOBAL HISTORY OF HEALTH PROJECT

PROJECT OVERVIEW | WESTERN HEMISPHERE MODULE | EUROPEAN MODULE | CONTACT | ABOUT

HEALTH INDEX



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- follow-up project from the Western Hemisphere Project [Steckel & Rose 2002]
- c. 11,000 datasets representing individual skeletons from 83 sites and a time span from 500 BC into the 19th century
- online database, loading from desktop clients
- web platform for data management
- broad funding for data acquisition, consumed before start of analyses

VI. TEETH

ORAL HEALTH

We assess oral health through antemortem tooth loss, teeth with carious lesions, and dental abscesses. Dental caries is a disease process characterized by focal demineralization of dental hard tissues by bacterial acids produced by fermentation of dietary carbohydrates. Dental caries is multifactorial, but diet is a central factor in its cause. Typically, populations with high carbohydrate consumption express the highest prevalence of the disease. Although antemortem tooth loss frequently results from carious lesions, it may also result from periodontal disease and heavy tooth wear. Abscesses can result from progressive caries or from tooth wear rapid enough to exceed the dentin's ability to fill the pulp chamber. Abscesses can be life threatening, or at the very least diminish resistance to disease and, even more than caries, affect dietary intake. The following variables are recorded for each dentition:

- 1) total number of erupted tooth positions observed
- 2) total number of erupted permanent teeth observed
- 3) total number of permanent teeth with carious lesions
- 4) total number of teeth lost premortem
- 5) total number of abscesses observed

A carious lesion is "present" if a stained, irregular walled cavity is evident from visual inspection. Abscesses are recognized by a clear drainage passage in the alveolar bone leading from the tooth root(s) to the external surface of either maxilla or mandible.



- collaborative efforts are possible with sufficient funding
- a sustainable data base is among the principle objectives of osteological anthropology

- importance of meticulous definition of standards
- importance of documenting all stages of investigations
- importance of professional data management

Previous Work and Experiences

Global History of Health Project

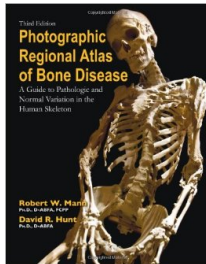
Mushroom Hunters' Club

Traces of Armed Conflict

Requirements for a Data Standard and Accompanying Software



- Systematic literature research on skeletal markers
- Systematisation of skeletal markers
- Database of skeletal markers and possible interpretations



[Mann & Hunt 2012]



- Most text books work from medical records towards relatively unspecific osteological markers; more research on markers as such is required
- It is all very complicated
- Long-term commitment is essential

Previous Work and Experiences

Global History of Health Project

Mushroom Hunters' Club

Traces of Armed Conflict

Requirements for a Data Standard and Accompanying Software

- PhD thesis Felix Engel
- Trauma analysis on > 1,000 skulls
- Development of own analytical routine

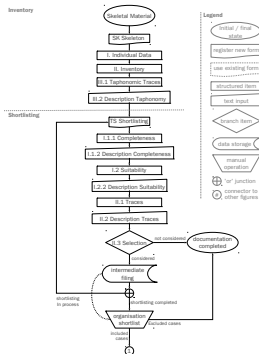
Traces of Armed Conflict

Skeletal Investigation

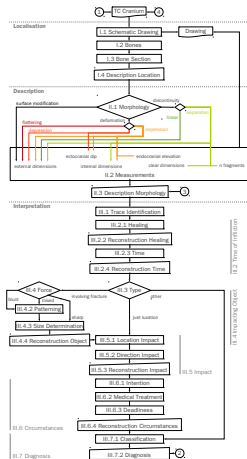


Traces of Armed Conflict

Trauma Analysis



(a)



(b)



- Research projects are logistic undertakings that profit from software support
- Systematic and standardised skeletal trauma analysis is possible
 - shortlisting is a crucial analytical step
 - strict separation of description and interpretation
 - modelling the entire line of reasoning

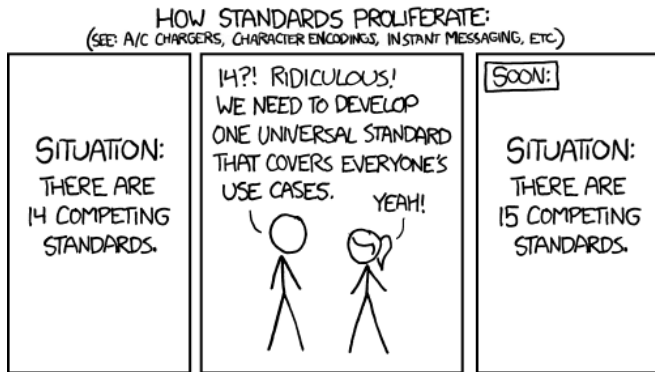
Previous Work and Experiences

Requirements for a Data Standard and Accompanying Software

Considerations Concerning the Data Standard

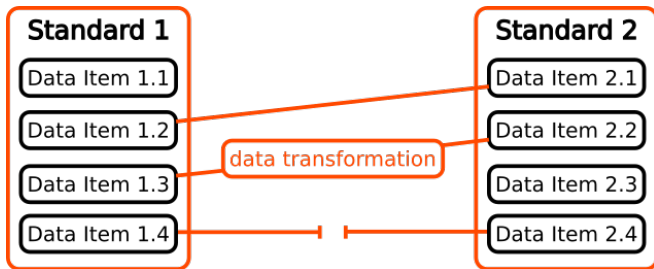
Considerations Concerning the Database Application

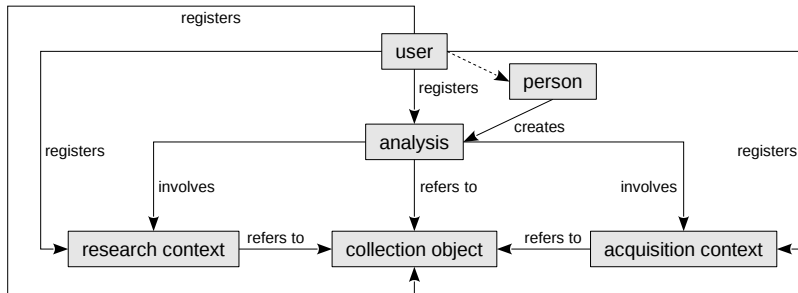
»Compile a Codebook as a Standard for Data Acquisition in Anthropological Collections«

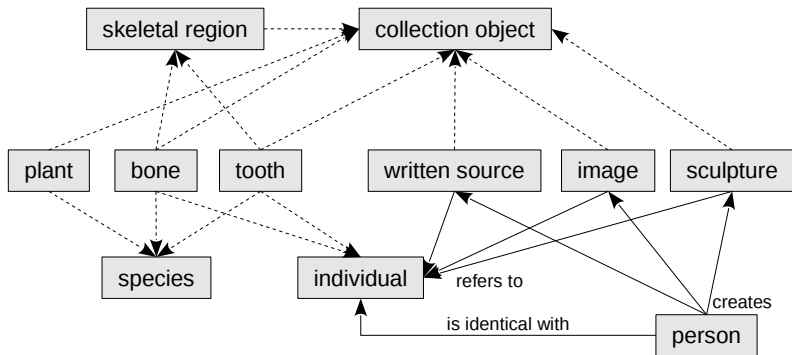


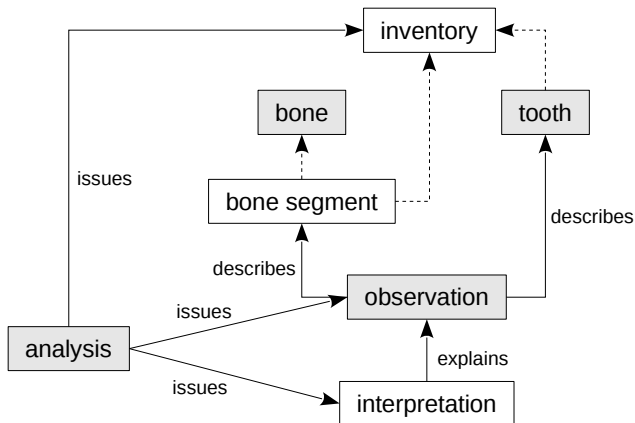
xkcd 927 by Randall Munroe

- Definition of compatibility not on the basis of standards but of data items

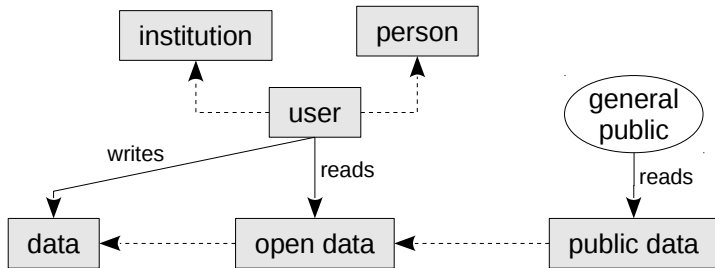








Access Rights Management and Data Publication



Previous Work and Experiences

Requirements for a Data Standard and Accompanying Software

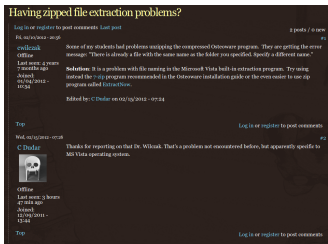
Considerations Concerning the Data Standard

Considerations Concerning the Database Application

Separation of Standards and Software



Desktop vs. Server Application



source: Osteoware Forum



source: PerceptionIT Blog

- network-independent
- data sovereignty
- OS-independent
- collaborative
- publication platform
- centralised administration/configuration

'Usable' vs. Configurable Software



Advance your research
Discover scientific knowledge, and make your research visible.

Reference management - Simplified
Save in one place, access anywhere

WEB OF SCIENCE™
The world's most cited and highly respected scholarly literature

Intelligent results, brilliant conclusions
Search and discover the world's leading scholarly journals and scientific articles

(a)

```
#!/usr/bin/perl
my $file = "data.txt";
my $header = "Header";
my $column = "Column";
my $delimiter = "\t";

my $cmd = "cat $file | grep $header | awk -F '$delimiter' '{print $column}'";
system($cmd);
```

Number of Species Table

Species	Weight
1	1.000
2	1.000
3	1.000
4	1.000
5	1.000
6	1.000
7	1.000
8	1.000
9	1.000
10	1.000

Number of Species by Continent

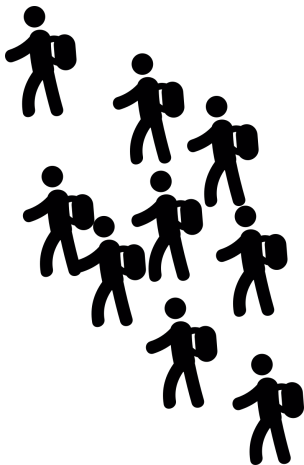
Continent	Number of Species
Africa	1
Asia	2
Europe	3
North America	4
South America	5
Oceania	6
Antarctica	7

Distance Between Overlap Motifs

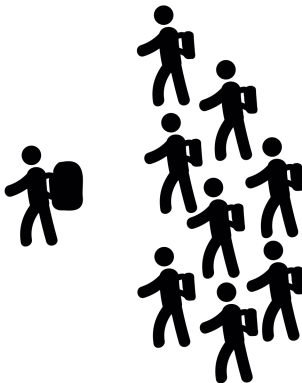
Time

(b)

'Usable' vs. Configurable Software






(a)



(b)

- Diverse research contexts necessitate an **open data model**
- Methodological variety and progress necessitate **extensions** (e. g. package system)
- Limited technical support necessitates **server-based application**
- Data sovereignty necessitates multiple installations and **access rights management**
- Data standard should serve as a basis for **publishing methods**.
- Data output should satisfy demands of digital and non-digital **archiving**.

- How can we model the individual data items?
- How do we organise extension packages?
- How can we make the graphical user interface adapt to new extensions?

-  Mann RW, Hunt DR. 2012. Photographic Regional Atlas of Bone Disease: A Guide to Pathologic and Normal Variations in the Human Skeleton. Springfield: Charles C. Thomas.
-  Steckel RH, Larsen CS, Sciulli PW, Walker PL (Eds.). 2006. Data Collection Codebook. URL: http://global.sbs.ohio-state.edu/new_docs/Codebook-01-24-11-em.pdf
-  Steckel RH, Rose JC (Eds.). 2002. The Backbone of History: Health and Nutrition in the Western Hemisphere. Cambridge: Cambridge University Press.