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| **books** |
| **\_id** : BSON ObjectId |
| name : String |
| authors : Array of String |
| isbn : String |
| genres : Array of String |
| pages : Int32 |
| words : Int32 |
| pub\_date : Date |
| publisher : Array of String |
| last\_updated : Date |

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| **loans** |
| **\_id :** BSON ObjectId |
| book : ObjectId (books.\_id) |
| borrower : ObjectId (borrowers.\_id) |
| begin\_date : Date |
| end\_date : Date |
| returned : bool |

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| **borrowers** |
| **\_id** : BSON ObjectId |
| username : String |
| password : String |
| name : String |
| email : String |
| address : String |
| phone : String |
| last\_updated : Date |

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| --- |
| **library** |
| **\_id** : ObjectId |
| quota : Int32 |
| period : Int32 |

**Justification**

Librarium has a relatively simple relational database structure, consisting of 3 data storage collections and 1 configuration collection. There are only 2 foreign key links originating from *loans* and ending at *books* and *borrowers*.

*Librarium* allows the user to check out which books they themselves have borrowed and which books within the library have been borrowed. It would not make sense to dump loan data within *books* as it would take more time for the borrower to check which books they have borrowed. Hence, I decided to have a separate *loans* database. Having a separate *loans* database also allows me to check whether a book has been borrowed by querying for the book’s BSON ObjectId and checking for *loans.returned: false* and allows a user to see what books they had borrowed by using their borrower *borrowers.\_id*, which is important to check whether a borrower has no unreturned books when they delete their account (checking not yet implemented). My pure linking approach allows the library to create unique return dates for each loan and makes it easier to search loans both ways through a *borrowers.\_id* and through a *books.\_id*.

*Bibliothekos* sends more read requests through *Librarium* to the library database than write requests. This should mean that I should have used a hybrid embedding data storage method. However, I thought it would be better for organisation if I separated *loans* from *books*.

*LIbrarium* allows the storage of historical loan data, which means that a linking database would be better than to store all that data within *books* itself.