

# Open translations in mathematics

Community building and resources for the future

Tim Hosgood (Topos Institute)  
24th of February, 2025

Warning: *I am merely a  
mathematician*

# Topos Institute

A mission-driven non-profit  
research institute

## Topos Institute

Realising a world where the systems that surround us benefit

### Who are we?

We are a mission-driven non-profit research institute

In a complex and changing world, how can we build a society in which all people and communities can flourish? We believe technology can play a pivotal role, but only if well-crafted to be responsive to the values, care, and meaning we each hold.

We research, build, and serve others through new technologies that enable cooperation across difference. We seek to both advance humanity's capacity for knowledge and compassion, and to help address the pressing, systemic challenges of our time, including

We do not "solve" the "problem" of translation by imposing a universal language

The "problem" becomes a benefit if we promote *more* languages and get better at translation

I would like *more and more*  
of these workshops, not  
*fewer and fewer*

# Plan

1. Translation in the context of science
2. Previous projects, large and small
3. Useful tools
4. Difficulties
5. Future resources

# 1. Translation in the context of science

Translation is that which  
transforms everything so  
that nothing changes

— one of the first Google results for "quotes about translation"

# Scientific (as opposed to literary) translation

Simpler? Less subjective?

- Not really, no. [citation: books; the rest of this talk; the rest of this fortnight]

# Scientific (as opposed to literary) translation

Things to consider, both big and small

- Should I translate notation (such as "Set" instead of "Ens")?
- Should I correct typos or mis-numberings?
- Should I correct mathematical mistakes? (e.g. following errata)
- Should I update the bibliography?
- Should I explain ambiguous sentences?
- Should I update notation and terminology?
- What is the tone of the prose between the "dry" mathematics?
- How careful is the author in distinguishing between almost-synonyms? ("consequently", "subsequently", "thus", "and so")
- Is the author formulaic in their construction of sentences?
- Is the vocabulary specific to the author, to the time, to the language, etc.? ("en effet")
- ...

Adam Huttner-Koros —  
*English: a hegemony*

[theatlantic.com/science/archive/2015/08/english-universal-language-science-research/400919/](http://theatlantic.com/science/archive/2015/08/english-universal-language-science-research/400919/)

- [...] In short, scientists who want to produce influential, globally recognized work most likely need to publish in English—which means they'll also likely have to attend English-language conferences, read English-language papers, and have English-language discussions.
- [...] “domain collapse,” or “the progressive deterioration of competence in [a language] in high-level discourses.” In other words, as a language stops adapting to changes in a given field, it can eventually cease to be an effective means of communication in certain contexts altogether.

**Eureka!**

~~Heureka!~~

~~Heureka!~~

~~Eureka!~~

~~Voilà!~~

~~Эврика!~~

Minhyong Kim —  
*Who Owns Mathematics:  
A Question of Identity*

[topos.institute/events/topos-colloquium/slides/  
2023-11-30.pdf](https://topos.institute/events/topos-colloquium/slides/2023-11-30.pdf)

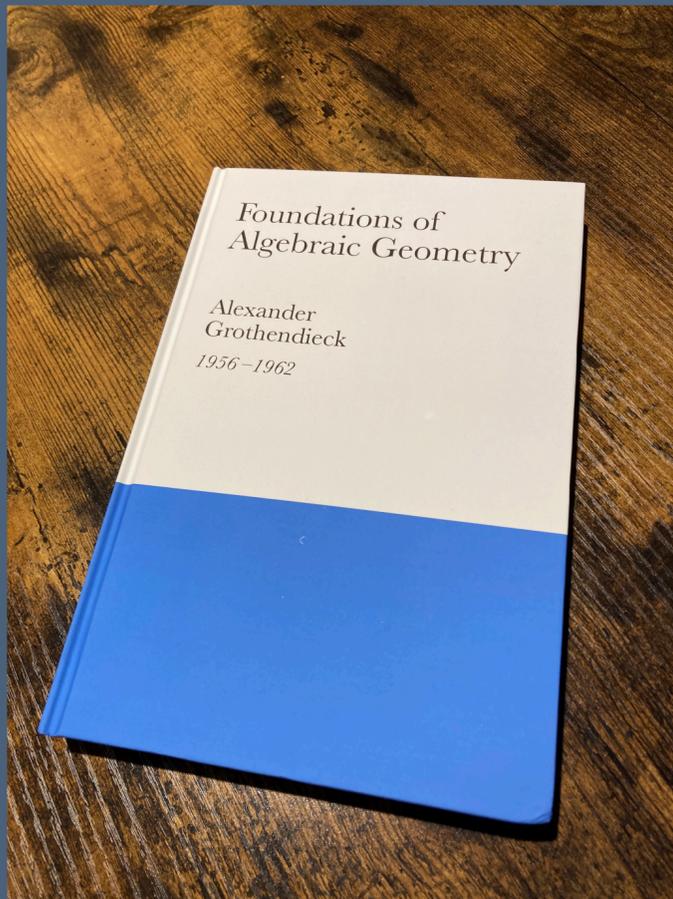
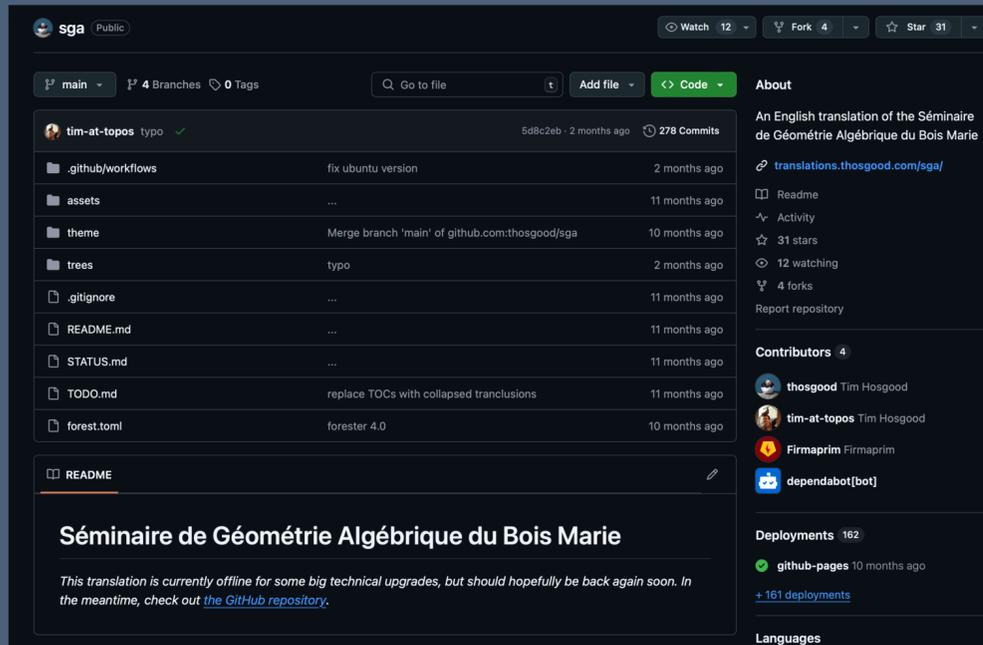
- Abu Rayhan Muhammad ibn Ahmad al-Biruni (973–1050) calculated the radius of the Earth to within 1% accuracy. Was al-Biruni Soviet? Was he Uzbek? Was he Iranian? Was he Persian? Was he Arabic?
- Why were there no Roman mathematicians? [...] because they were defined out of existence [by historians].
- Thomas Jefferson, Notes on the State of Virginia (1785): "*Comparing them by their faculties of memory, reason, and imagination, it appears to me, that in memory they are equal to the whites; in reason much inferior, as think one could scarcely be found capable of tracing and comprehending the investigations of Euclid.*" [...] In fact, no one knows anything about about Euclid's ethnicity. All we know is that they probably lived all their life in Africa.
- Thales lived in present day Turkey. Pythagoras was born in Samos, but lived and studied all around the Mediterranean. Erathostenes was born and lived in present day Libya. Heron, Ptolemy, and Diophantus were born and lived in present day Egypt.
- **We will all be included in a book on the global history of the English written by a future historian.**

# English translations as a stepping stone

## Acting intentionally

- English is, for better or worse, the most lingua franca of languages for science...
- ... *but this doesn't mean we should stop there*
- Translating a specific text into English is a good way of building a community around that work, and laying the foundations (technical and cultural) for translations into other languages
- Our *choice* of texts to translate can help to *highlight* non-English sources

2. Previous projects, large and small



## Articles

- M Balazard, E Saias, M Yor. "Notes sur la fonction  $\zeta$  de Riemann, 2". *Adv. in Math.* 143 (1999) pp. 284–287. [web](#) | [PDF](#) | [source original](#)
- A Borel, J-P Serre. "Le théorème de Riemann-Roch". *Bull. Soc. Math. Fr.* 86 (1958) pp. 97–136. DOI: [10.24033/bsmf.1500](#) [web](#) | [PDF](#) | [source original](#)
- P Deligne. "Variétés abéliennes ordinaires sur un corps fini". *Inv. Math.* 8 (1969) pp. 238–243. [web](#) | [PDF](#) | [source original](#)
- P Deligne. "Théorie de Hodge I, II". (I) *Actes du Congrès intern. math.* 1 (1970) pp. 425–430. (II) *Pub. Math. de l'IHÉS* 40 (1971) pp. 5–58. [web](#) | [source original \(I\)](#) | [original \(II\)](#)
- P Deligne. "A quoi servent les motifs?". *Proc. Symp. in Pure Math.* 55 (1994) pp. 143–161. [web](#) | [PDF](#) | [source original](#)
- Y Diers. "Catégories Multialgébriques". *Archiv der Math.* 34 (1980) pp. 193–209. DOI: [10.1007/BF01224953](#) [PDF](#) | [source](#)
- P Donato, P Iglesias. "Exemples de groupes différentiels: flots irrationnels". *C. R. Acad. Sc.* 301 (1985) pp. 127–130.

## Seminars

### *Séminaire Bourbaki, Extracts (1948–49), "Les travaux de Koszul"*

In the first series of the Séminaire Bourbaki, H Cartan gave three talks concerning the work of J-L Koszul on Lie algebras. (These specific talks were given in 1948–49, but first published *Séminaire Bourbaki* collection was printed in 1952, containing the first talks, and dating from 1948 up until 1951). I have combined all three talks into one document.

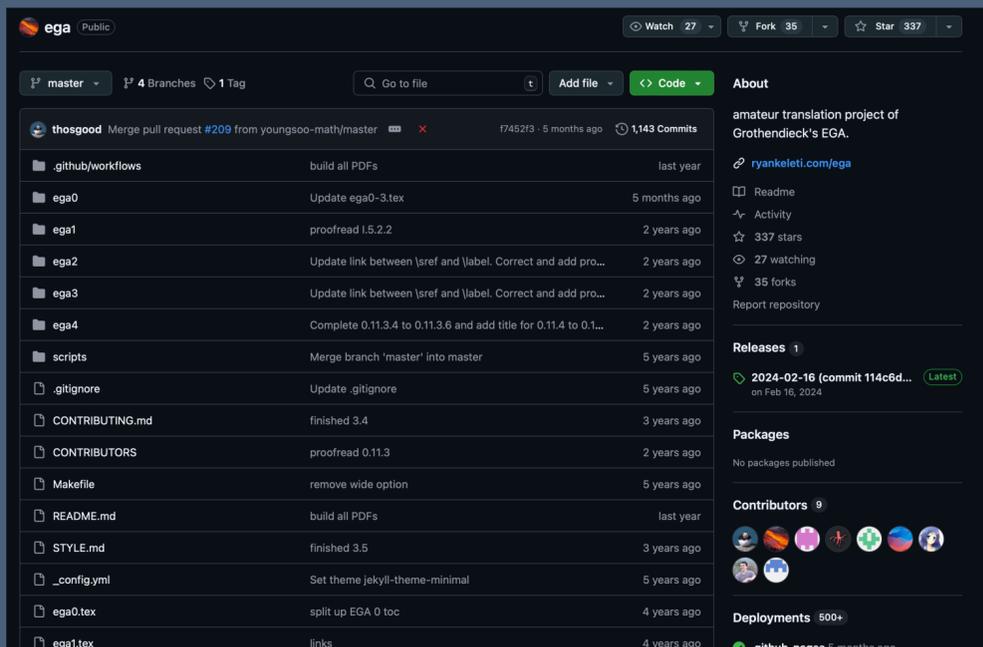
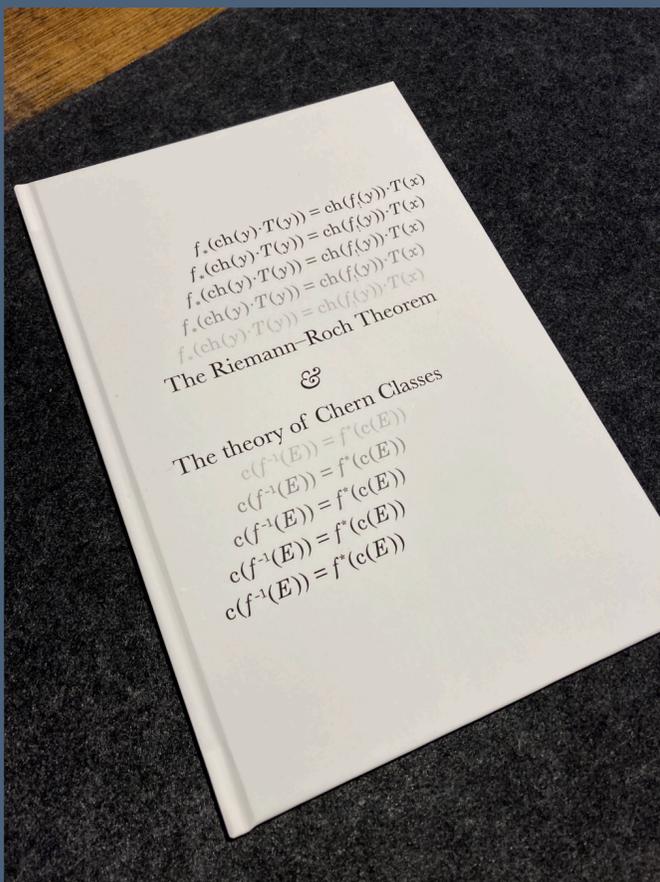
- H Cartan. "Les travaux de Koszul, I, II, and III". *Séminaire Bourbaki* 1 (1952) pp. Talks no. 1, 8, and 12. [web](#) | [PDF](#) | [source original \(I\)](#) | [original \(II\)](#) | [original \(III\)](#)

### *Séminaire Claude Chevalley, Volume 4 (1958–59), "Variétés de Picard"*

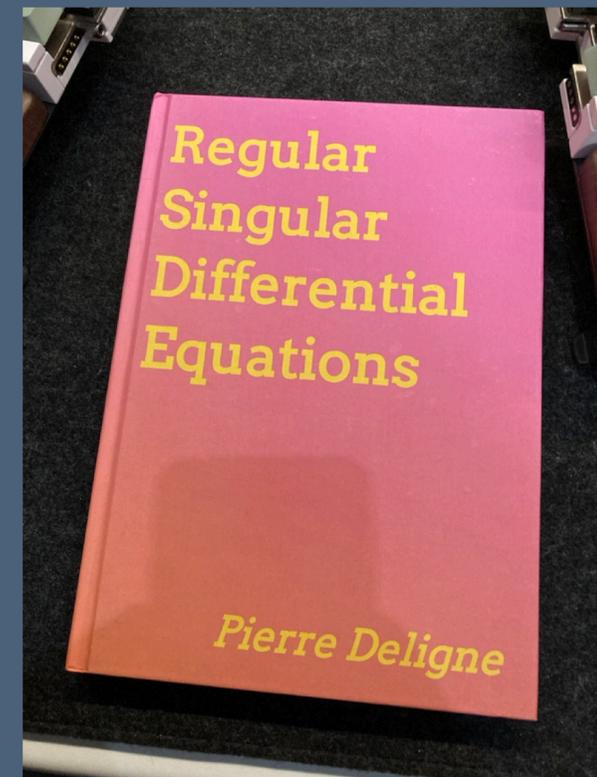
1. P Gabriel. "Faisceaux quasi-cohérents". [web](#) | [PDF](#) | [source original](#)
2. P Gabriel. "Le théorème de Serre". [web](#) | [PDF](#) | [source original](#)
4. C S Seshadri. "Diviseurs en géométrie algébrique". [web](#) | [PDF](#) | [source original](#)
9. A Douady. "Variétés abéliennes". [web](#) | [PDF](#) | [source original](#)

### *Séminaire Henri Cartan, Volume 9 (1956–57), "Quelques questions de topologie"*

2. A Grothendieck. "Sur les faisceaux algébriques et les faisceaux analytiques



mostly French,  
algebraic geometry  
and category theory  
(because this is my  
background)



# EGA

## Some history

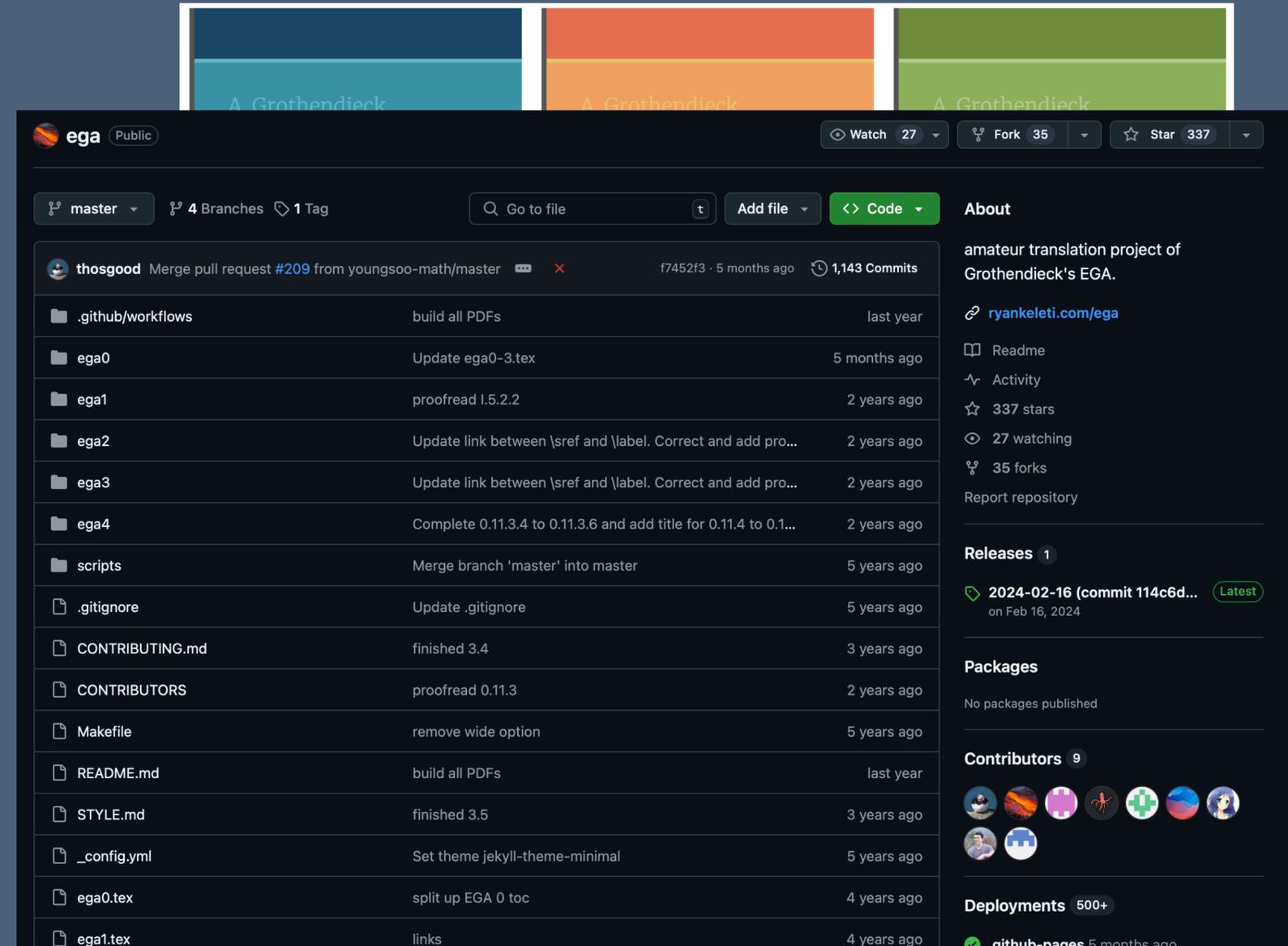
- Foundational work in algebraic geometry, category theory, sheaf theory, ...
- Written throughout the 1960s by Grothendieck and Dieudonné
- Never fully completed, only (!) ~1,800 pages published
- Still the standard reference for many statements for the contemporary working geometer
- (My initial motivation for translation)



# EGA

## The translation

- Translation mainly joint with Ryan Keleti, but some other (~6) community contributions too
- ~500 pages (~25,000 lines) already translated (EGA I and II, and the corresponding parts of EGA 0)...
- ... ~1,300 pages left
- >300 stars on GitHub, lots of MathOverflow upvotes
- but... why? We have the Stacks project, and "mathematical French is easy"



# EGA

## Some reasons (good and/or bad) for an English translation

- Modern PDFs (or even web versions) are so much easier to navigate than scans
- Lengthy errata and addenda have since been published
- The nature of the statements means that they are often incredibly technical, with complex quantifiers and modifying adjectives, making machine translation (or "French is easy" translation) unreliable
- Dry, Bourbaki-esque language
- Lots of people online asking for a translation
- Many people are doing this in their heads/notebooks anyway when they read it, leading to a *lot* of repeated work
- The set of (English or French) speakers is strictly larger than the set of French speakers
- It's an excuse for me to read it
- It's an opportunity for (often early-career) mathematicians to build a community

# Grothendieck's '91 letter to Thomason on Derivators

## Examples of the difficulties of translating mathematical letters

- Cultural context, such as sayings and profanity:
  - *Having looked at this work (if we can call it that) with attention, I am happy that it is not yours — it made me gnash my teeth from start to finish, and more besides.*
  - *[...] you are very capable of finding where it screws up by yourself [...]*
- Writing style of the author:
  - *This will probably be my next letter, if you are interested in continuing this correspondence. In which case I will be very happy to have you as an interlocutor of my cogitations!*

# Two of C. Ehresmann's papers on double categories

In the context of his *Collected Works*, edited by A. Ehresmann

- Somewhat nonstandard (by today's writing) notation and definitions (e.g. functors/functions)
- One of the original works on double categories, but largely unread by many working in the double categorical renaissance currently underway
- Contextualised within a *Collected Works*, including errata and addenda *in English* by A. Ehresmann
  - These give authoritative translations for terminology that has not elsewhere (as far as I can tell) been translated
- Andrée was very happy with the possibility of wider readership

# Multilingual maths dictionary

Open source, community written

- ~50 contributors in 16 languages
- ~300 entries, each linked to Wikidata
- Semi-automated Wikidata imports to be checked by native speakers
- Large Catalan and Basque contributions, at high technical level
- Just one large .json file
- Grammatical gender, but no plurals/cases/etc.

Part of the [Multilingual Mathematics](#) project: [mulima.xyz](#)  
Source code: [\[thosgood/maths-dictionary\]](#)

To contribute, either submit a PR on GitHub, use the [\(beta\) submission tool](#), or just contact me directly!

Català  Euskara  Italiano  Polski  汉语  
 Deutsch  فارسی  日本語  Português  
 English  Suomi  한국어  Русский  
 Español  Français  Türkçe

Any entries that appear **like this** are ones that have not been manually checked by a native speaker.  
*If the table does not load, try refreshing the page.*  
*If you only see empty rows, try clicking the language name in the table header to change the sorting.*

10 entries per page Search:

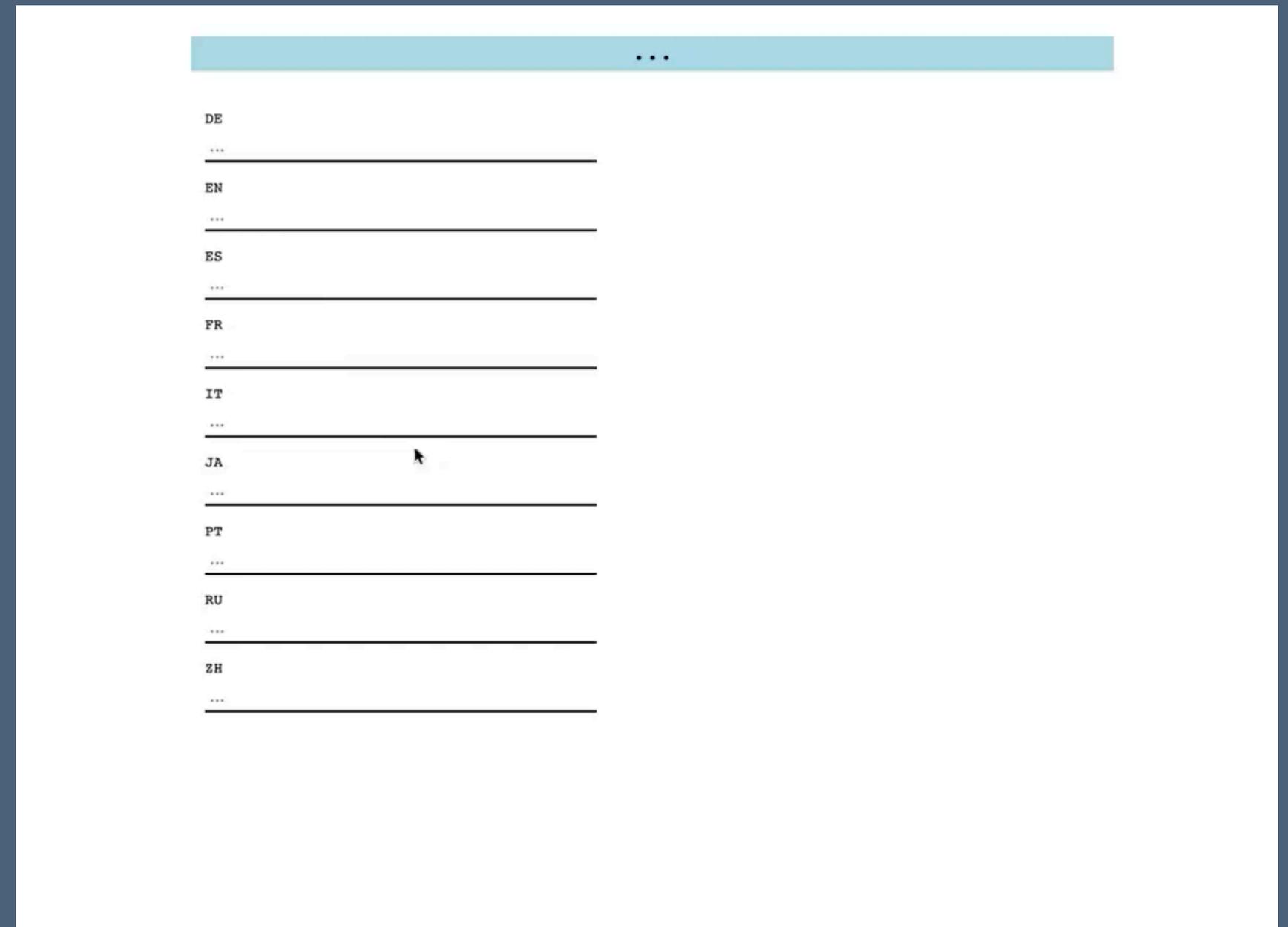
Reference	EN	FA	FR
<a href="#">Q318737</a>	abelian category	رسته آبدلی	catégorie abélienne (f)
<a href="#">Q181296</a>	abelian group	گروه آبدلی	groupe abélien (m)
<a href="#">Q515874</a>	abscissa		abscisse (f)
<a href="#">Q120812</a>	absolute value		valeur absolue (m)
<a href="#">Q91134251</a>	absolutely convergent series		série absolument convergente (f)
<a href="#">Q844451</a>	acnode	نقطه منزوی	point isolé (m)
<a href="#">Q3250296</a>	acute angle		angle aigu (m)
<a href="#">Q32043</a>	addition	جمع	addition (f)
<a href="#">Q4681343</a>	additive category	رسته جمع پذیر	catégorie additive (f)
<a href="#">Q320346</a>	adherence		adhérence (f)

Showing 1 to 10 of 316 entries « < 1 2 3 4 5 ... 32 > »

# Parsers and a DSL

Imagining tailored technologies

- Small proof-of-concept web app
- Parser-based, non-statistical
- Plugs in to the maths dictionary
- "Scratch/Lego for writing Bourbaki"
- Similar (in some sense) to the Formal Abstract project



# 3. Useful tools

# Contemporaneous work (and later)

For specific terminology, but also general sentence construction

- Other texts by the same author?
- Other texts published in the same volume/book?
- Reprints (collected works)?
- Commentaries, reviews, summaries?
- Textbooks (if available)?
- Texts that cite it?
- MathOverflow, or even Wikipedia?

# Wikipedia and Wikidata

Fantastic when it's fantastic

## algebra over a field (Q1000660)

vector space equipped with a bilinear product

algebra

 edit

[In more languages](#)

[Configure](#)

Language	Label	Description	Also known as
default for all languages	No label defined	<span>⋮</span>	
English	algebra over a field	vector space equipped with a bilinear product	algebra
French	algèbre sur un corps	No description defined	algèbre
German	Algebra über einem Körper	Vektorraum über einem Körper, der um eine mit der Vektorraumstruktur verträgliche Multiplikation erweitert wurde	Algebra über K K-Algebra Algebra über einem Körper K Algebra
Spanish	álgebra sobre un cuerpo	No description defined	algebra sobre un cuerpo algebra

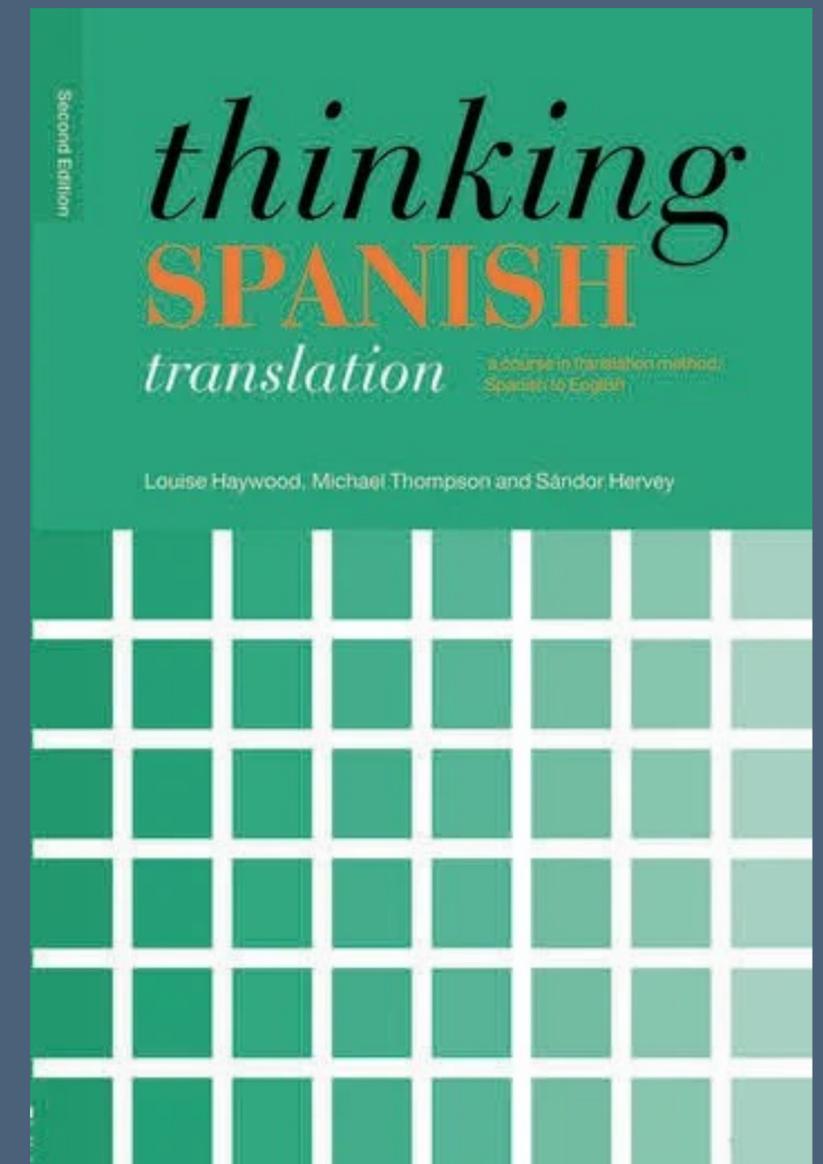
Wikipedia (28 entries)  edit

- arwiki جبر على حقل
- bgwiki Алгебра над поле
- cawiki Àlgebra sobre un cos
- cswiki Algebra (struktura)
- cvwiki Алгебра (уй җийән)
- dewiki Algebra über einem Körper
- enwiki Algebra over a field
- eowiki Àlgebra
- eswiki Álgebra sobre un cuerpo
- fawiki جبر روی یک میدان
- frwiki Algèbre sur un corps
- glwiki Álgebra sobre un corpo
- iawiki Algebra super un corpore
- idwiki Aljabar atas medan
- itwiki Algebra su campo
- jawiki 体上の多元環
- nlwiki Algebra (structuur)
- nnwiki Algebra over ein kropp
- plwiki Algebra nad ciałem
- ptwiki Álgebra sobre um corpo
- rowiki Algebră peste un corp
- ruwiki Алгебра над полем
- svwiki Algebra över en kropp
- ukwiki Алгебра над полем
- viwiki Đại số trên một trường
- zh\_classicalwiki 代數 (代數)
- zh\_yuewiki 代數 (代數結構)
- zhwiki 域上的代数

# Translation methodology

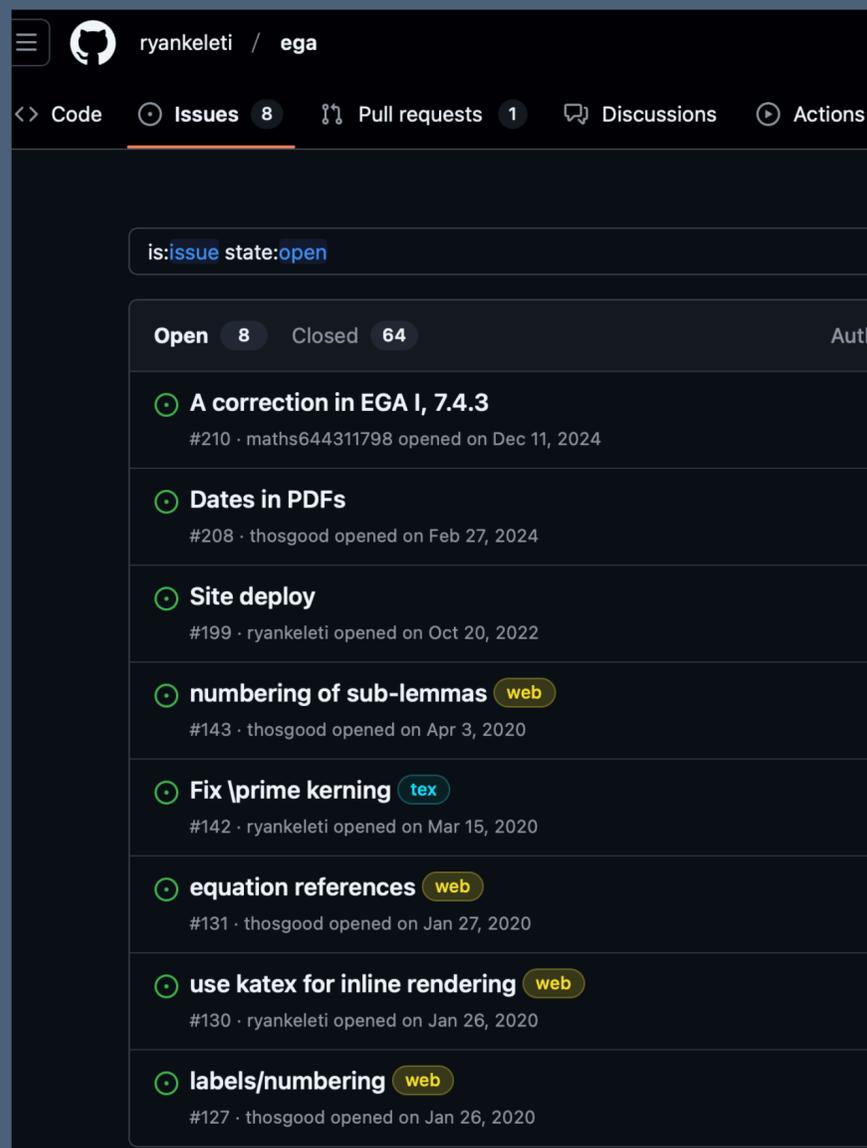
Don't forget that translation is itself an entire field of study

- Scientific (or "technical") translation is a standard (choice) part in a course in translation — not as simple as "simply" being a bilingual domain expert
- There are good arguments that highlight how it is in fact just as "contextually subjective" as literary translation, but in different ways
- Highlighting the importance of the "pre-translation" work
  - Reduce duplication of effort
  - Make it possible to resolve detailed questions in a consistent manner
  - Good for building community standards ("style guide")



# GitHub

## Issues, pull requests, and builds



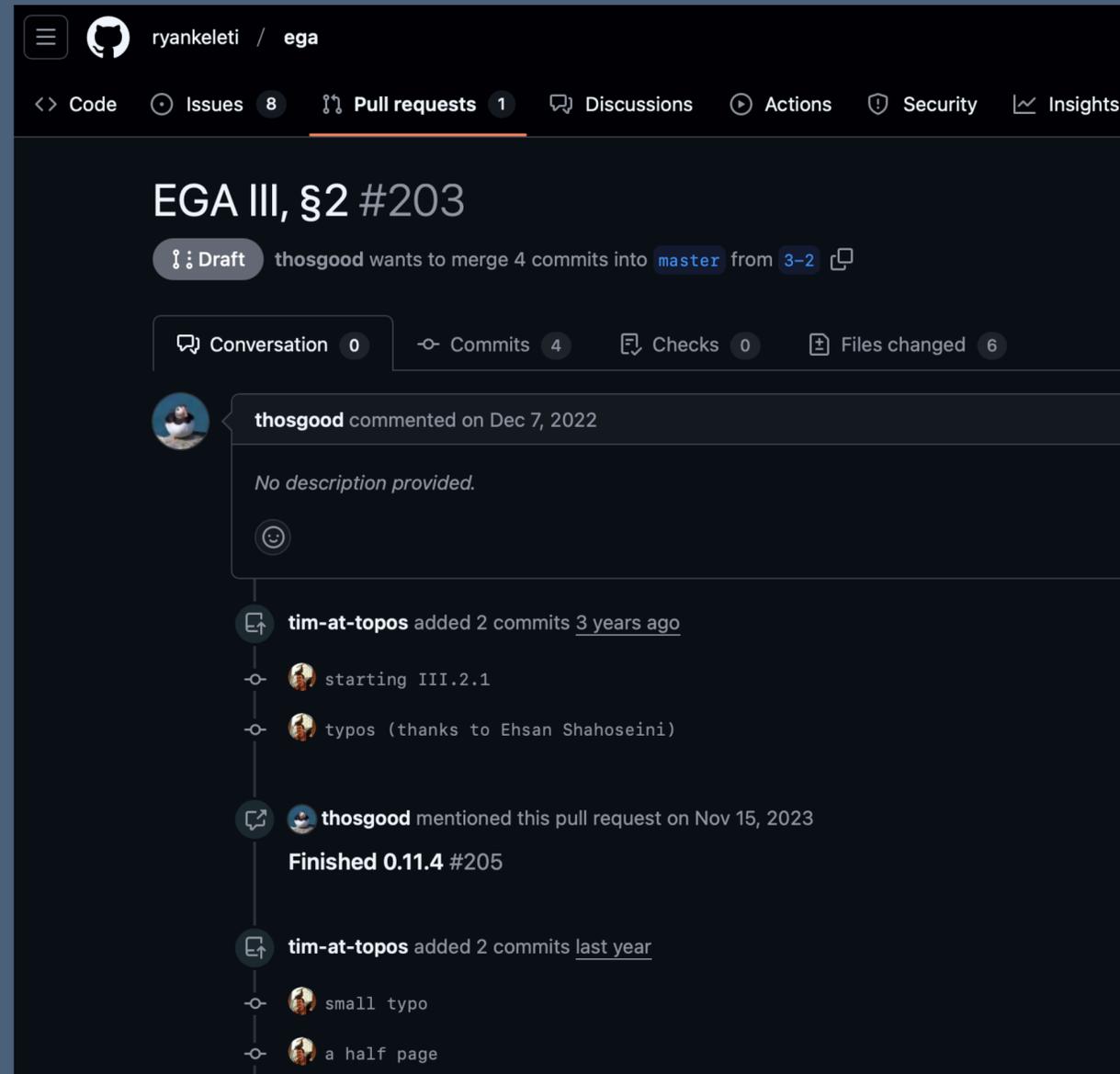
ryankeleti / ega

<> Code Issues 8 Pull requests 1 Discussions Actions

is:issue state:open

Open 8 Closed 64

- A correction in EGA I, 7.4.3  
#210 · maths644311798 opened on Dec 11, 2024
- Dates in PDFs  
#208 · thosgood opened on Feb 27, 2024
- Site deploy  
#199 · ryankeleti opened on Oct 20, 2022
- numbering of sub-lemmas **web**  
#143 · thosgood opened on Apr 3, 2020
- Fix \prime kerning **tex**  
#142 · ryankeleti opened on Mar 15, 2020
- equation references **web**  
#131 · thosgood opened on Jan 27, 2020
- use katex for inline rendering **web**  
#130 · ryankeleti opened on Jan 26, 2020
- labels/numbering **web**  
#127 · thosgood opened on Jan 26, 2020



ryankeleti / ega

<> Code Issues 8 Pull requests 1 Discussions Actions Security Insights

### EGA III, §2 #203

**Draft** thosgood wants to merge 4 commits into `master` from `3-2`

Conversation 0 Commits 4 Checks 0 Files changed 6

thosgood commented on Dec 7, 2022

No description provided.

tim-at-topos added 2 commits 3 years ago

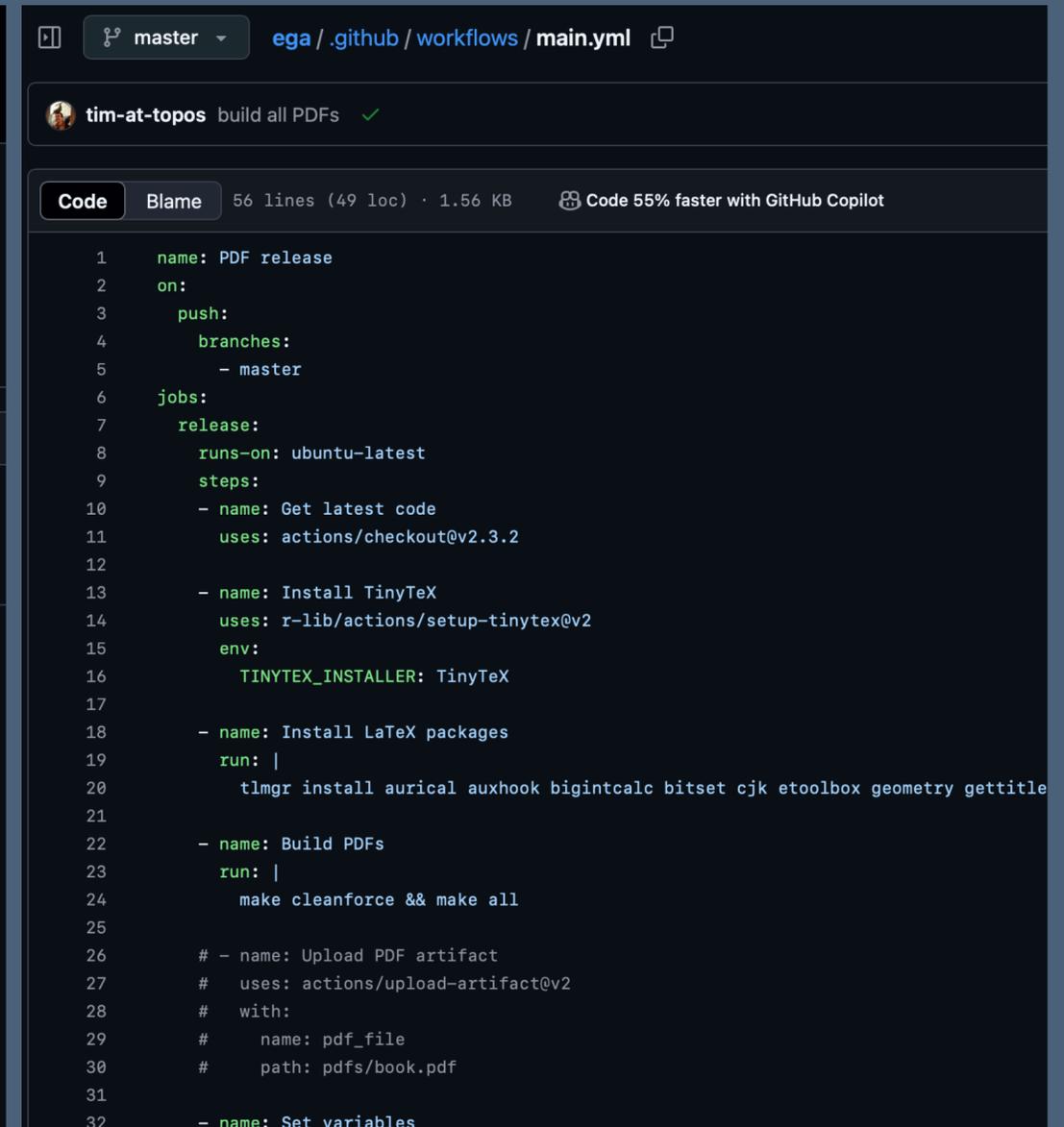
- starting III.2.1
- typos (thanks to Ehsan Shahoseini)

thosgood mentioned this pull request on Nov 15, 2023

#### Finished 0.11.4 #205

tim-at-topos added 2 commits last year

- small typo
- a half page



master ega / .github / workflows / main.yml

tim-at-topos build all PDFs ✓

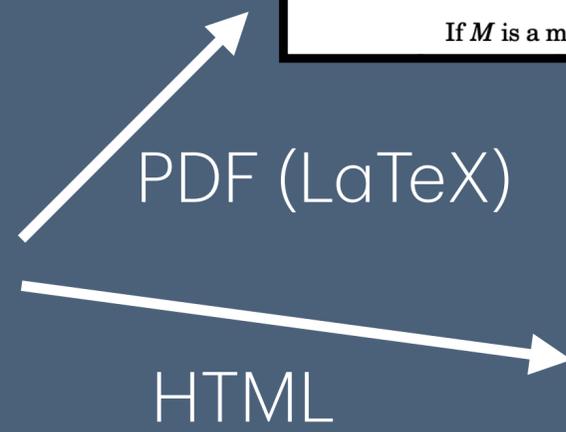
Code Blame 56 lines (49 loc) · 1.56 KB Code 55% faster with GitHub Copilot

```
1 name: PDF release
2 on:
3   push:
4     branches:
5       - master
6 jobs:
7   release:
8     runs-on: ubuntu-latest
9     steps:
10    - name: Get latest code
11      uses: actions/checkout@v2.3.2
12
13    - name: Install TinyTeX
14      uses: r-lib/actions/setup-tinytex@v2
15      env:
16        TINYTEX_INSTALLER: TinyTeX
17
18    - name: Install LaTeX packages
19      run: |
20        tlmgr install aurical auxhook bigintcalc bitset cjk etoolbox geometry gettitle
21
22    - name: Build PDFs
23      run: |
24        make cleanforce && make all
25
26    # - name: Upload PDF artifact
27      # uses: actions/upload-artifact@v2
28      # with:
29        # name: pdf_file
30        # path: pdfs/book.pdf
31
32    - name: Set variables
```

# RMarkdown

```
1 ---
2 title: "Divisors in algebraic geometry"
3 author: "C.S. Seshadri"
4 date: "1958--59"
5 original: 'Seshadri, C. S. "Diviseurs en géométrie algébrique". _Sé
6 bibliography: SCC-4-4.bib
7 nocite: '@*'
8 link-citations: true
9 csl: maths-translations.csl
10 reference-section-title: "Bibliography"
11 github-repo: "thosgood/translations"
12 favicon: "favicon.ico"
13 ---
```

```
103
104 Let  $\mathcal{F}$  be a torsion-free coherent sheaf on a variety  $X$ .
105 Then the canonical homomorphism  $\mathcal{F} \rightarrow \mathcal{F} \otimes_{\mathcal{O}_X} \mathcal{O}_X$  is injective.
106 The sheaves  $\mathcal{F}$  and  $\mathcal{F} \otimes_{\mathcal{O}_X} \mathcal{O}_X$  are locally constant sheaves.
107 We can then identify  $\mathcal{F} \otimes_{\mathcal{O}_X} \mathcal{O}_X$  with a vector space of finite dimension.
108 We call this dimension the rank of  $\mathcal{F}$ , and we can then consider  $\mathcal{F}$  as a
109
110 ::: {.itenv #proposition-4 title="Proposition 4" latex="{Proposition 4}"}
111 Under the same hypotheses as in [Proposition 3](#proposition-3), there exists a coherent sheaf
112 then  $\mathcal{O}_X^n / (\mathcal{I} \cdot \mathcal{F})$  and  $\mathcal{F} / (\mathcal{I} \cdot \mathcal{F})$  are torsion-free.
113 :::
114
115 ::: {.proof}
116 The proof is immediate.
117 :::
118
119 \oldpage{4-03}
120 If  $Y$  is a closed subset of an algebraic space  $X$ , then we denote by  $\mathcal{I}_Y$  the ideal sheaf of
121
122 ::: {.itenv #proposition-5 title="Proposition 5" latex="{Proposition 5}"}
123 Let  $Y$  be a closed subset of an algebraic space  $X$ , and  $\mathcal{F}$  a coherent sheaf on  $X$ .
124 then there exists an integer  $k$  such that  $\mathcal{I}_Y^k \cdot \mathcal{F} = 0$ .
125 :::
126
127 ::: {.proof}
128 We can reduce to the case where  $X$  is affine, since there exists a finite cover of
129 In this case, the hypothesis implies that the set defined by the ideal  $\text{ann}(\mathcal{F})$ 
130 This implies, as is well known, that  $\text{ann}(\mathcal{F})(X) \supseteq \mathcal{I}_Y^k$ .
131 :::
132
```



1 Preliminaries

---

## Divisors in algebraic geometry

C.S. Seshadri  
1958–59

**Translator's note**

*This page is a translation into English of the following:*

Seshadri, C. S. "Diviseurs en géométrie algébrique." *Séminaire Claude Chevalley* 4 (1958–59), Talk no. 4. [numdam.org/item/SCC\\_1958-1959\\_\\_4\\_\\_A4\\_0](https://numdam.org/item/SCC_1958-1959__4__A4_0)

*The translator (Tim Hosgood) takes full responsibility for any errors introduced, and claims no rights to any of the mathematical content herein.*

Version: 9bcba86

In the first part of this talk, we will prove a theorem of Serre on complete varieties [6], following the methods of Grothendieck [4]. The second part is dedicated to generalities on divisors. In the literature, we often call the divisors studied here "locally principal" divisors.

The algebraic spaces considered here are defined over an algebraically closed field  $K$ . By "variety," we mean an irreducible algebraic space. If  $X$  is an algebraic space, we denote by  $\mathcal{O}(X)$ ,  $\mathcal{R}(X)$ , etc. (or simply  $\mathcal{O}$ ,  $\mathcal{R}$ , etc.) the structure sheaf, of regular functions, etc. on  $X$  (to define  $\mathcal{R}(X)$  we assume that  $X$  is a variety). By "coherent sheaf" on  $X$ , we mean a coherent sheaf of  $\mathcal{O}$ -modules on  $X$ .

### 1 Preliminaries

References: [4–6]

If  $M$  is a module over an integral ring  $A$  (commutative and with 1), then we say that an

Table of contents

- 1 Preliminaries
- 2 Dévissage theorem
- 3 Divisors (Generalities)
- Bibliography

## Divisors in algebraic geometry

C.S. Seshadri 1958–59

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### 1 Preliminaries

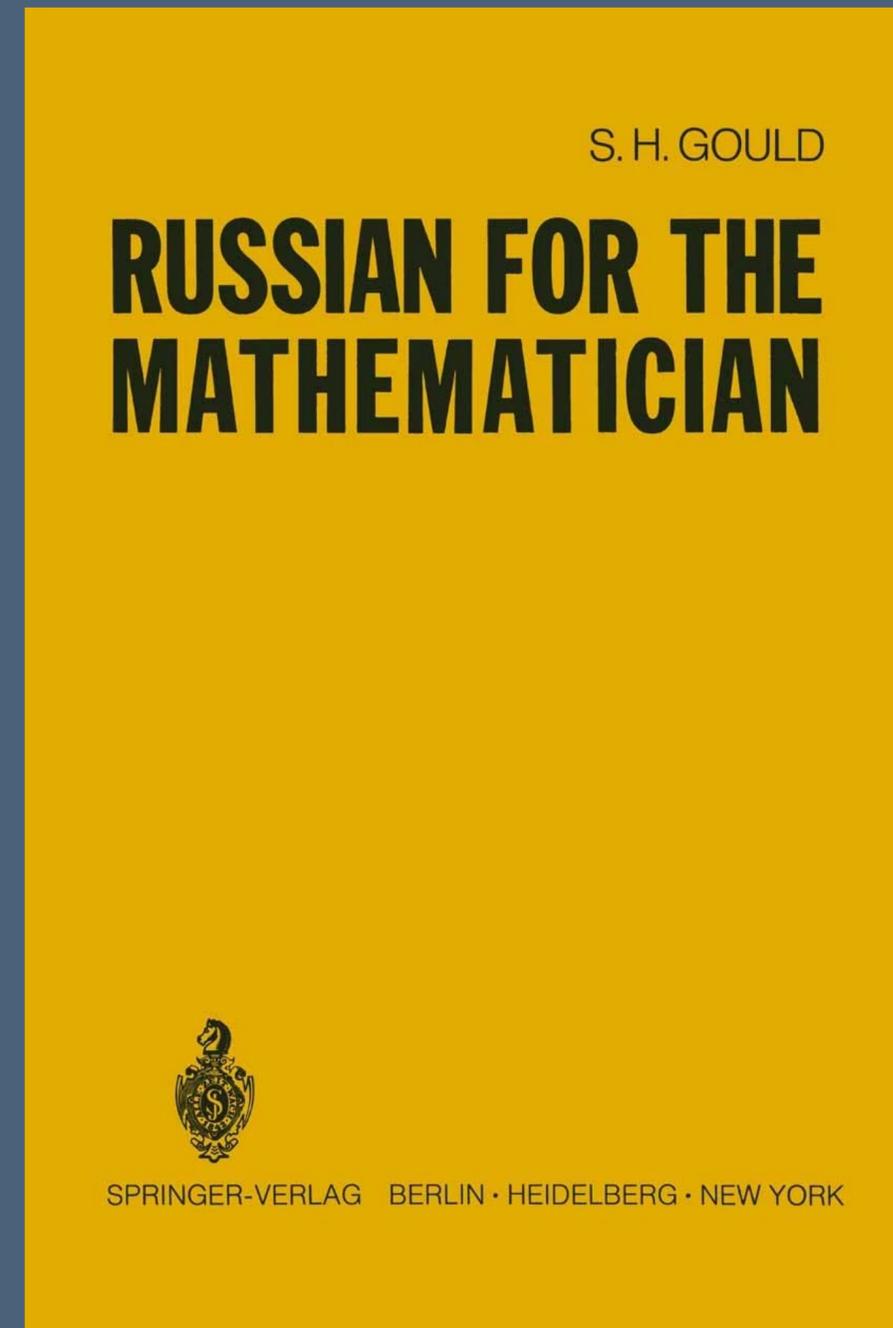
References: [4–6]

If  $M$  is a module over an integral ring  $A$  (commutative and with 1), then we say that an

# Russian for the Mathematician

The only book of its kind?

- "The Board of Trustees of the American Mathematical Society, expressing its belief that a great deal of time would be saved for mathematicians if they could study a textbook of Russian precisely adapted to their needs, granted to the present author nine months leave of absence from his duties as Editor of Translations."

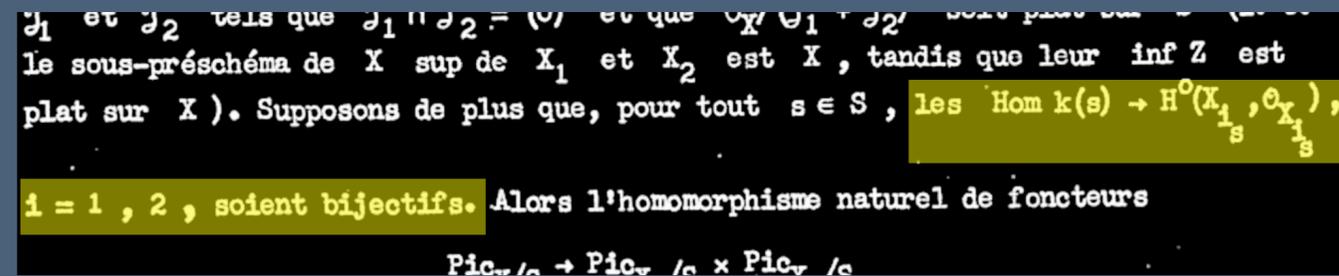


# 4. Difficulties

# Technical terminology

Things can get oh-so specific

- Sometimes a native speaker (or good standard dictionary) could suffice
  - ... but sometimes you need them to be a mathematician
  - ... in the specific domain
  - ... from a specific period of time
    - Example: "trace" — not even anywhere on any relevant French Wikipedia page... apart from the actual page
- (Also sometimes there are just typos, mistakes, or even mildly (forgivably) sloppy writing)



# Technical terminology

Bingener, J. "Über formale komplexe Räume"

In der vorliegenden Arbeit soll nun zunächst die Grundtheorie der formalen komplexen Räume entwickelt werden. Letztere werden in 1 als induktive Limiten eines geeigneten Systems von komplexen Räumen eingeführt. Spezielle formale komplexe Räume erhält man, wenn man die formalen Komplettierungen komplexer Räume längs analytischer Teilmengen betrachtet. Natürlich ist auch jeder komplexe Raum ein formaler komplexer Raum. Die Strukturgarbe  $\mathcal{O}_X$  eines formalen komplexen Raumes  $X$  ist stets kohärent mit lokalen noetherschen Halmringen ((1.1) und (1.4)). Es ist von Bedeutung zu wissen, daß wie bei den komplexen Räumen die Schnitttringe Steinscher Kompakta in  $X$  ausgezeichnete noethersche Ringe sind ((1.4), (1.10)). Formale komplexe Räume lassen sich (lokal) in Zahlenräume einbetten, vgl. (1.7).

In the present article, we first develop the basic theory of formal complex spaces. These are introduced in §1 as inductive limits of a suitable system of complex spaces. We obtain special formal complex spaces if we consider the formal completions of complex spaces along analytical subsets. Of course, every complex space is also a formal complex space. The structure sheaf  $\mathcal{O}_X$  of a formal complex space  $X$  is always coherent with local Noetherian stalks ((1.1) and (1.4)). It is important to know that, as in the case of complex spaces, the **!!TO-DO: intersection rings?!!** of compact Stein subsets of  $X$  are excellent Noetherian rings ((1.4) and (1.10)). Formal complex spaces can be (locally) embedded into **!!TO-DO: number spaces?!!**, cf. (1.7).

# Anachronistic translation

Where does translation end and commentary begin?

- Terminology changes over time, in many ways
  - "good", "satisfying Axiom B", "of Grothendieck [G1967a]"  $\mapsto$  ?
  - Do we translate "literally", or so that the modern reader will know what it means? Footnote it?
- Different choices are made at different times by different groups
  - In double categories: vertical/horizontal vs. horizontal/vertical vs. taut/loose vs. tight/loose vs. arrow/pro-arrow vs. weft/warp
  - "tribu" vs " $\sigma$ -algèbre"
  - ... why did the author make their specific choice?

# Ambiguity inherent to English

Or: different languages do different things in different ways

- Sometimes a word-for-word translation will be much more ambiguous in English than in French/German/any language with grammatical gender/case/any accordances (e.g. plurality of adjectives)
- Certain "grammatically correct" constructions in English can sound overly formal:

In order for X to satisfy Y

that Z satisfy W

For X to satisfy Y

it is necessary and sufficient

that Z satisfies W

To have that X satisfying Y

for Z to satisfy W

[it is necessary and sufficient for Z to satisfy W for X to satisfy Y] ?!

# Editorial consistency

## Community submissions and community vibes

- How do we make it sound like a community translation glosses nicely as if written by a single author?
  - (Bonus question: do we always want this?)
  - Style guides help, but ...
    - ... hard to write, and even harder to write well
    - ... don't solve all problems (even in a monolingual environment!)
- How much effort should be asked of contributors?
  - "I ran this chapter through Google Translate"
  - Balancing useful contributions with unnecessary gatekeeping
- What counts as a contribution?

# 5. Future resources

# Improved maths dictionary

## Enabling community

- More utility as a single-language dictionary
  - Pluralisation, cases, ... ???
  - Common phrases ("let  $X$  be a  $Y$ ", "if  $A$  then  $B$ ", "it is necessary and sufficient that")
  - Example sentences from actual papers, placing words into context
- Better usability as software
  - Allow people to make suggestions, comments, corrections
  - Export vocab lists for specific language pairs (and specific topics?)
- Really figure out how to make it "open by design"

# Weblate

Translation for software ... for mathematics?

Webplate Dashboard Projects Languages Checks

WebplateOrg / Django / Czech / Translate translated 96%

Custom search '%(count)s word'

Position and priority

Translation

English

**Singular**

%(count)s word

**Plural**

%(count)s words

**Czech, One**

%(count)s slovo

**Czech, Few**

%(count)s slova

**Czech, Other**

%(count)s slov

Plural formula: (n==1) ? 0 : (n>=2 && n<=4) ? 1 : 2

Needs editing

Save and continue Save and stay Suggest Skip

Glossary

English Czech

No related strings found in the glossary.

Add term to glossary

String information

Screenshot context No screenshot currently associated.

Add screenshot

Explanation No explanation currently provided.

Labels No labels currently set.

Flags python-format

Source string location

Nearby strings 20 Comments Automatic suggestions Other languages 3

History

New comment

Comment on this string for fellow translators and developers to read.

Scope

Translation comment, discussions with other translators

Is your comment specific to this translation or generic for all of them?

New comment

You can use Markdown and mention users by @username.

Save

weblate/templates/translation.html:149

String age 7 seconds ago

Source string age 7 seconds ago

Translation file weblate/locale/cs/LC\_MESSAGE S/django.po, string 5

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# *Languages* for the Mathematician

Tailored introductions to languages

- Highly specific: I can't go to the cinema last weekend with my friends, but I can take a left Kan extension along an acyclic cofibration of delta lenses
- Start with useful building-block phrases ("let  $X$  be a  $Y$ ", "if  $A$  then  $B$ ", etc.) and general vocabulary (definition/theorem/proof)
- Vocabulary lists for specific domains
- Examples from actual papers
- What would a term-long course based on this look like?
  - Masters theses?

# Expository articles and blog posts

Again: translation over universality

- General expository articles (AMS "What is...") in non-English languages
  - Help people with translations in both directions
  - Push back against domain collapse
  - Build communities around translation, indirectly
  - Highlight language-specific references
    - We "know" what these might be for the most common languages (German complex geometry, French category theory, Italian geometry), but are still missing key parts, and ...
    - ... what about all the things we don't know? What mathematics is happening in Basque? in Farsi?

# GitHub templates

Reducing technological cost of entry

- Somebody wants to create a community around a new translation project? "One click" setup for it all:
  - Repository
  - Issues
  - Discussions
  - Builds
  - Contributor lists

# Workshops and conferences

Like this one!

- I was so excited to get an invite!
- **Building on top of "mere" translation and into commentary/exposition/historical contextualisation is seen as core in other domains, so why not in mathematics?**
  - Creating legitimacy and "prestige" is hard, but events and community building is not a bad way to start
- Good excuse to bring together TL and SL researchers
  - Run the translation parts in tandem with standard research talks
- Long-term dream: more multi-lingual journals

Thanks!