

“Mathematical Education” in Belgium.

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2010
Storrs, UConn (Connecticut (USA))

- 1 Belgium in general
- 2 Education in Belgium
- 3 “Mathematical Education”

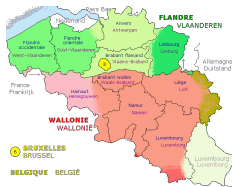
- 1 Belgium in general
 - 1 Where is it?
 - 2 What do you need to know about Belgium?
- 2 Education in Belgium
- 3 “Mathematical Education”

Belgium in Europe



- Member of EU.
- Time zone: UTC + 2 (in Summer)

Belgium



- Capital: Brussels (Capital of EU)
- Languages: French, Dutch, German
- Motto: “Strength through Unity”
- Anthem: The “Brabançonne”
- Area: 30,528 km^2
- Population: 11,000,000 (great density)
- Currency: Euro

History

- Independence from Netherlands: 1830
- Monarchy (but **no** power):
 - First King: Leopold 1st
 - Now: Albert 2nd (he is the 6th king)
- 2 hard periods: first world war ('14-'18) and second ('40-'45)
- → thanks to Americans who helped us



What to visit and taste?



- Some cities: Brussels, Bruges, Namur, Antwerpen
- Sea (check up forecast before!!!) and lots of forested zone
- Of course: chips, chocolate and beers

Some Belgian known?

Movies: Jean-Claude Van Damme ('60)

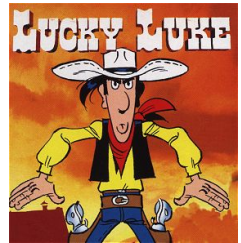
- Double impact, full contact, JCVD,...



Some Belgian known?

Comics:

- Hergé (Tintin)
- Peyo (The “Schtroumpfs”)
- Morris (Lucky Luke)



Some Belgian known?

Scientists:

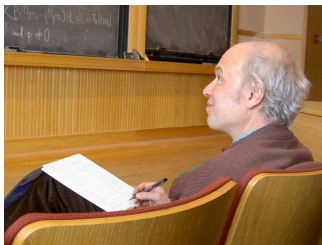
- Georges Lemaitre (1894 → 1966, Big Bang theory)
- Ilya Prigogine (1917 → 2003, Nobel Prize in chemistry)



Some Belgian known?

Mathematicians:

- Pierre Deligne ('44, Fields Medal in '78)
- Jean Bourgain ('54, Fields Medal in '94)



Some Belgian known in sport?

Cycling: Eddy Merckx ('45)

- 5 “Tour de France” ('69– >' 74),
- 5 “giro” and 2 “vuelta”,
- **One day race:** 7 “Milan-San Remo”, 3 “Tour des Flandres”, 5 “Liege-Bastogne-Liege”, 3 “Paris-Roubaix”
- 2 world championships



Some Belgian known in sport?

Tennis: Kim Clijsters ('83)

- 2 US Open, 2 Masters, 1 Fed Cup, Number one...and a girl of 2!!!

and Justine Hénin ('82)

- 2 US Open, 1 Australian Open, 4 French Open, 2 Masters, Olympic champion, 1 Fed cup, number one.



Some Belgian known in sport?

Soccer: team sport number one ('45)

- Olympic champion in 1920
- Second place at European championship in 1980
- Fourth place at **World Cup** in 1986
- Fourth place at Olympic Games in 2008



Some Belgian known in sport?

Basketball (man): Didier Mbenga ('80 in Congo)

- First Belgian in NBA
- He's playing for Lakers
- Champion in '09



- ① Belgium in general
- ② Education in Belgium
 - ① What about politics?
 - ② Elementary School
 - ③ Secondary School
 - ④ High School and Universities
- ③ “Mathematical Education”

Politics: very **complicated** (related to 3 languages)!!!

Different levels of power

- **Federal** one

- ① **Government** (head: Prime Minister (Yves Leterme)): **"build"** laws
- ② Bicameral **Parliament** (Senate and Chamber of Representatives elected by Belgian people): **vote** laws

- **Community** one: Community and Region Governments (and Parliaments) for each language

→ **Many** ministers in each topics

→ slow system to solve problems!!!

Remarks: compulsory voting system **and** only one round.

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- 1 Pre-School (3 years, 2.5 → 6): **NOT** an obligation
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- 3 Secondary School (6 years, 12 → 18, **free**): you must go to school until 18.
- 4 Superior School: High School **or** University.

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- Learn Basis: reading, writing in French, counting,...
- Only one person to teach all the topics (18–22 by class)
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- Commun final exam in 6th year
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- One teacher by topic
- Tests all the time and final exam in each topics every year
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- The level gets down **fastly** (political and social reasons)
- Three “levels”: Profesional, Technical and General

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Aim: To work directly at 18.

- **Manual jobs:** bricklayer, finish carpenter,...
- midwife, nursing auxiliary, help-family,...

Aim:

- **Mix** up between theoretical and “manual” courses.
- You work at 19 (with one more year) or go to high school
- You can switch to Profesional level at every moment **but not** to general one.

Possibilities:

- accountant, “social teacher”, secretary,...

General “level”

Aim:

- Only theoretical courses
- You can switch to technical or professional level at every moment.
- After, you **must** go to high school or University.

Problem if you fail.

The **three first years** are commun at everyone in this “level”.

- **Languages:** french ($5h/w$), dutch or english ($4h/w$), (Latin or greek ($4h/w$))
- **“Sciences”:** math ($4h/w$), sciences ($3h/w$)
- **Miscellaneous:** geography ($2h/w$), history ($2h/w$), gym ($3h/w$)

Then, you choose **options** (Math-Sciences, (Math-Latin), Sciences-Languages,...)

- **Commun part:** geography ($2h/w$), history ($2h/w$), french ($4h/w$), gym ($3h/w$),...
- **Option:** Math ($4h/w \rightarrow 6$ or $8h/w$), Sciences ($2h/w \rightarrow 5h/w$), languages ($6h/w \rightarrow 8h/w$)

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High School (3 years)

- Teacher in pre-school or elementary schools
- Math, french, english,... teacher in secondary schools (3 first years)
- Technician (in computer, electricity,...), nurse,...

University (at least 5 years (3 + 2)), you can study

- Math, french, latin, languages, physics,...
- Political sciences
- Study to become a lawyer
- Business sciences
- Medical sciences (doctor(7y), dentist(5y), pharmacist(5y),...)
- Engineering

University diploma → research, teaching in secondary school, working in private,...

- ① Belgium in general
- ② Education in Belgium
- ③ “Mathematical Education”
 - ① Math Program at the secondary school
 - ② What to do to be a Teacher at the secondary school?
 - ③ What about research in mathematics?

- **Three first years:**

- Calculus (fractions, $(a + b)(c + d) = \dots$, $(a \pm b)^2 = a^2 \pm 2ab + b^2$, powers, square root,...)
- Geometry (compute area and volumes, Pythagore, Thales, notion of isometry,...)

- **Year 4:**

- Functions (notion of domain, application, image, study of classical functions, dilatation of functions,...),
- Equations

- **Year 5 (if 6h/w):**

- Analysis (sequence, limit, derivative)
- Inequations
- Analytical geometry (notion of plane, hyperplane,...)

- **Year 6 (if 6h/w):**

- Analysis (integrals, arcsin and arccos functions)
- Complex space \mathbb{C}
- Matrices, Determinant

- Teacher can **not** ask during homeworks, tests or exams something not done in classroom.
 - Students never think by themselves...**big trouble** in maths!!!
- Exercices **must be** given in a “live” context or “games”
 - Technics and “boring” calculus are avoided
 - Students do not control basis calculus as well as before.

Aim: to be teacher in secondary school (3 **first year**)

- you **just** learn again the program of secondary school (**no more**)
- lots of **pedagogy** lessons and **practice** in schools

Aim: to do research, to be a teacher in secondary school or work in private (banks,...)

How is it working?

- Bologna Process defined some rules (signed up in '98, started in '04)
 - 5 years: 3 general (called **bac**) and 2 specialized (called **master**)
 - Exams for each courses must be organized **twice** a year (end of the semester + September)
 - **Only** the final exam decid if you fail a course...so, no tests during the semester
- Each year, you must obtain 60% in average and 50% in each course
- Professors organize oral exam **or** written exam

Remark: Level gets down, students **does not control enough** courses and forget very fastly.

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First year:

- Elementary Mathematics (60h): recall of the secondary program
- Analysis (180h): limit in \mathbb{R}^N , continuity, derivative, Taylor development, differential equation (easy)
- Linear algebra (90h)
- Algebra (90h): notions of group, annulus, permutations,...
- You **choose** between computer science and physics lessons

Second year:

- Analysis (140h): Frechet derivative, Hilbert space, topology
- Algebra (60h): the goal is the Sylow theorems
- Probabilities (60h): introduction
- Logic (60h): introduction
- Differential manifold and complex analysis(60h): introduction
- You again **choose** between computer science and physics lessons

Third year:

- Analysis (110h): Lebesgue's integration, functional analysis, Banach spaces (L^p, l^p, \dots),
- Algebra (45h): the goal is the Galois classification
- Probabilities and statistics (45h)
- Logic (45h)
- Numerical analysis: rootfinding methods, interpolation, Runge-Kutta,
- You again **choose** between computer science and physics lessons

At this moment, you need to choose between

- To be a **teacher** in secondary school: pedagogy lessons and practice in schools
- To make a **PhD**: followed by a Professor, theoretical courses, go to seminars,...
- To work in **private**: business lessons, probabilities and practice in some companies

Remark: There is a Master-thesis to make in final year.

What about a PhD-thesis?

Two possibilities

- Grant from FNRS(like NRC): 4 years, related to an adviser
- Assistant (payed by the University): 6 years because you **must** give some lessons related to courses of your adviser

Thanks for your attention

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