CANS OF JAM²

From the editors

Good day to you all!
In this busy month full of exams and meetings to prepare next year, our young reporters have not had much time to write articles, but we hope you will enjoy their work, wherever you are...
And we have exceptionally included in this issue an illustrated version of one of the emails we received, because it really appealed to us; it was not written by a pupil, but by a reader; and in French, what is more; but we decided to translate it (with pains!) and to give it to you, hoping it will motivate our reporters.
We have also had the joy to learn that many of you read our magazine through the *académie*'s offical website; once again, do not hesitate to contact us if you want to subscribe directly and receive an internet copy of *cans of jam²*; all you need to do is send an email entitled 'cans of jam², subscription' to didier.galard@ac-amiens.fr, and you will be added to our mailing lists!
If you are a teacher, we would also be **very** interested in **anything** you did with the magazine and your pupils; we try to get better, but we need your opinion!
Having said that, we wish you all a very pleasant Summer, full of sunshine but not too hot, and we hope you will still be with us in September or October; for our part, we shall definitely return!

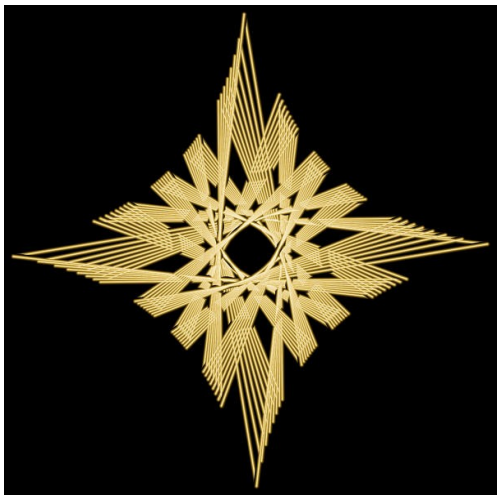
Readers' emails

Hello !
I read the magazine *cans of jams²* of this month (*editors' note : issue 9, from May 2011*) and I found each article very interesting. I like a lot the article about the perfect red.
I think of you because I still have things of the organic chemistry with the functions but maybe I won't have English lessons for one year, after the first half of next year.
I think that it's a shame because we risk forgetting things in one year...
Good luck to all the pupils in the final year of high school.

Florine, from Beauvais, 60

Well, Florine, we are always happy to have news from you, a former contributor to the magazine, and we are glad that you liked it! We are sure that you will find ways to practise your English and not forget it; you can start by writing articles for us if you like!
We wish you all the best for your exams if you have any still to come, and great Summer holidays!

Readers' emails, continued (translated, edited and illustrated by the editors), or, mathematics are beautiful



picture 1

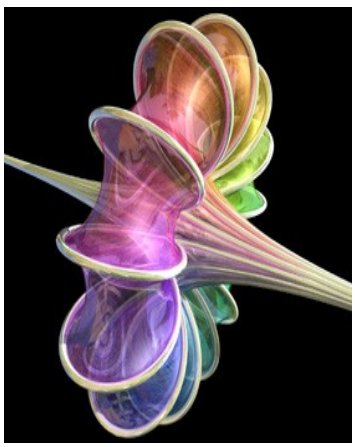
Thank you for this new issue of *cans of jam²*. Nice one, the experiment with the cigarette! It makes me want to try (or to show it to pupils, but I am not sure it would be to parents' liking!).
I particularly enjoy the experiments you do and illustrate in the magazine; keep on like that!
The chosen topics are often good, because they are varied and scientific but not too difficult to understand. And I ask you again for mathematics articles! It is such a beautiful and rich subject, there are so many things to talk about. And I can assure you that it can be fascinating (yes it can).
Here are some ideas which make nice pictures :
the quadrature of lunulas, Plato's regular polyhedrons (see the photo of Paul Nylander's hyperbolic dodecahedron), the stomachion, Archimedes' spiral, cissoids, Borromean rings, Esher's works, Fermat's spiral, cardioids, Torricelli's trumpet, astroids, sangakus...

picture 2

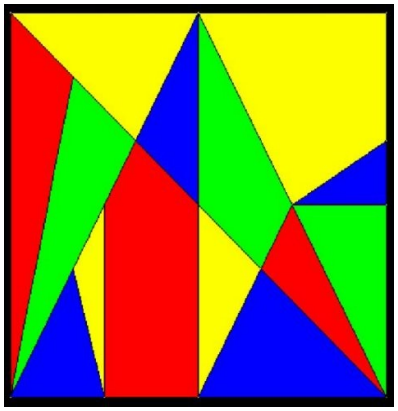
And I could also mention interesting subjects : Fibonacci's series, fractals, the story of the number zero, of chess, the golden section, Pascal's triangle,...
I will stop here, but I could quote a whole library; if needed, I can give you a hundred other ideas...
I hope that you are all well and that the end of the school year is coming nicely; you only have a handful of weeks to go, whereas we will work until the 2nd of July in our school, lucky you!
Hello to everyone.

Guillaume, from Faverges, 74

picture 3



picture 4



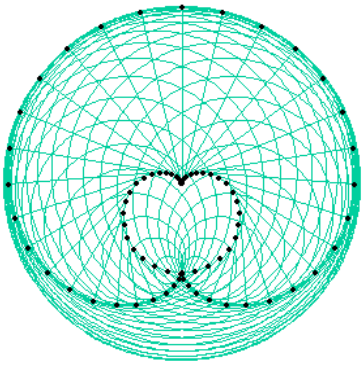
picture 5

Readers' emails, continued (translated, edited and illustrated by the editors), or, mathematics are beautiful

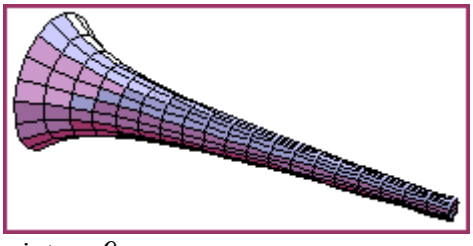
Guillaume, we hope you will like what we did with your email!
Next time, please ask someone around you to help you write in English, you lazy man! It took me ***ages*** *to translate and check all the mathematical words... Unfortunately, none of our pupils this year seemed interested in your suggestions; maybe they were a little too young, being in seconde...*
But we promise you that we are going to try and make them do it; as I browsed the internet to find what you were talking about, I was captivated by the beauty of it all, so we shall prepare something for September to make them like maths!
As for working until the 2nd of July, you are the lucky one : the second part of the baccalaureat will start the week after, and some of us will take part in a BTS jury as late as the 13th of July!
But anyway, we hope you will have splendid Summer holidays, and also that your email will convince some pupils that maths is indeed funny ***and*** *beautiful!*

picture 6

picture 7



picture 8



picture 9

So, for everyone, here is our little ***Summer game*** *: what do each of the nine pictures of this article represent? All the answers are of course in the text, so it should not be too difficult... And you will learn a lot about maths! Send your answers over the Summer to didier.galard@ac-amiens.fr, and enjoy!*

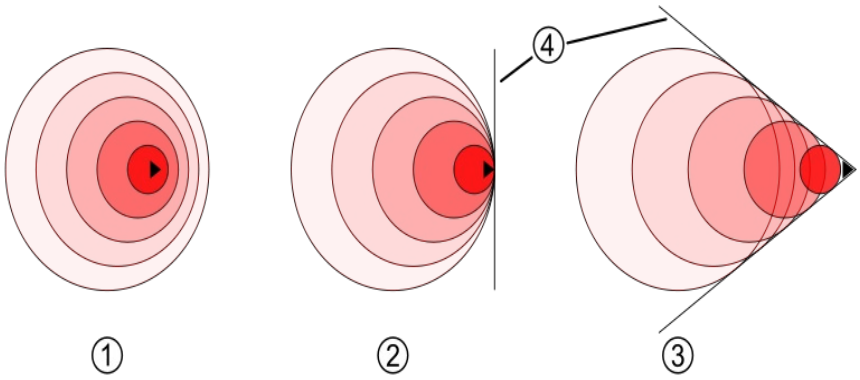
The sound barrier

Men have always wanted to know how to fly. About one hundred years ago, the first plane, l'Éole, was made by Clément Ader. After that, aviation then aeronautics became a hot field, and has always remained so.

Then men improved the planes and the engines to obtain more and more speed, until they managed to go faster than sound...

The first speed record was established by Chuck Yeager when he broke the sound barrier on October 14th, 1947 in the bell X-1. We are going to try to explain to you what the sound barrier is.

The sound barrier is an aerodynamic phenomenon. When the plane flies (the plane is the black triangle), it creates a multitude of layers of high and low pressure (caused by the sound waves) all around it (1).



If the pilot gives his engine the full throttle (2) and reaches mach 1 (the sound barrier, 4), or 1,236 km per hour at 20° C (3), all the little disruptions accumulate to create one big pressure difference just in front of the plane; it is called a shock wave, and it is responsible for the boom that occurs when the plane breaks this barrier (and it goes on as long as the plane flies faster than sound). Some people think you can even see it, but in fact, it is only the changes of pressure and of temperature which can sometimes generate a cone of vapour.

Be careful ! Live chemical weapons!

As you know, there are many bugs, all the time, around us. We don't really think these tiny creatures can be dangerous for humans, and yet, some of these minuscule animals are real chemical weapons! Indeed, some insects produce chemical substances which can hurt you, burn you, or KILL you! Let's see some examples ….

The *Graphosoma italicum* hides small glands under its thorax which contain a smelly liquid, and this smell of bitter almond reveals the presence of cyanide, that birds can smell.

Trapdoor spiders protect themselves with their fangs, and with the stinging hairs on their abdomen. When the spider rubs it whith its legs, it detaches and burrows into the skin of the attacker to diffuse stinging substances.

Some caterpillars have hairs or spines which are designed to break into thin points like needles and inject a painful venom. Caterpillars produce this venom when they eat toxic leaves and they stock it to protect themselves.

The sting of *Paroponera clavata,* an ant of central America, is the worst of all. Pain, which is the same as that of a bullet of firearm, lasts 24 hours. During initiation ceremonies of some forest tribes, boys have to show their courage by putting their arm in a strip of cloth full of these ants.

The *Atrax robustus* is one of the few spiders which can kill a human. Equipped with fangs strong enough to break a nail or shoe, it bites several times forcefully. Its venom destroys the nervous system : after pain, convulsions, vomiting, the victim falls into a coma and dies.

Be careful ! Live chemical weapons! (continued from page 5)

This scorpion from North Africa is the one which kills the biggest number of humans. Its venom contains neurotoxic substances which go in all your body. After a sting, you'll feel pain, shortness of breath, weakness, sweating, troubles of sight, rolling eyes, vomiting, diarrhea, chest pain, heart attack and death.

As you can see, smaller animals are not the least dangerous, so, be careful!

New elements!

The periodic table of the elements, well-known by all chemists, is going to be more difficult to learn : a team of Russian and American researchers have created two new elements, and are now looking for... Names!

These new elements could be called flerovium (instead of its temporary name, unuseptium, Uus, Z = 117), after Soviet nuclear scientist Georgy Flyorov, and moscovium (instead of its temporary name ununoctium, Uuo, Z = 118).

The first of them is a super heavy element, with 117 protons and 176 or 177 neutrons (two isotopes were created). This one was created by a collision between a calcium 48 isotope and a berkelium 249 isotope (first observed in 2010), the other one between calcium 48 and californium 249 (first observed in 2002).

Super heavy elements are usually radioactive, but decay almost instantly.

MIT's 150th anniversary

The Massachusetts Institute of Technology is celebrating its 150th anniversary this year.

This American university is famous for all the inventions and creations that they have made : did you know that the students and teachers there invented or helped to invent the telephone, electromagnets, radars, high-speed photography, office photocopiers, but also pocket calculators, the internet, lasers, and a lot more? Fifty Nobel Prize winners have come from MIT!

The slogan of the university is Mind and Hand (in Latin *Mens et Manus*), because their idea is that inventing something is great, but it has to be useful.

If you want to learn more about some of their current projects, you can look on the internet; we would recommend the key-words 'smart car', and 'sixth sense'; you will enjoy that!

One of the thing they do at MIT is taking brilliant researchers from different fields and putting them together; they are doing exactly that at the moment to find cures for cancer or solutions to global warming.

So, think of that when you watch the next season of NCIS (one of the heroes, Timothy MacGee, comes from MIT!).