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### **Descrierea CIP a Bibliotecii Naționale a României**

**Ins and outs of the magic möbius strip : the brochure of the project COM-11-PM-01-AR-RO / project coordinator: Liliana Negrilă - Arad: Editura Fundației "Moise Nicoară", 2013**  
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37

## 1. Summary

The metaphorical **title** of the project 2011-1-RO1-COM06-14636 is Ins and outs of the magic Möbius strip.

Our project involves four schools:

- "Moise Nicoara" National College, Arad, RO (the coordinator)
- Devonport High School for Girls, Plymouth, UK
- Justus-von-Liebig-Gymnasium, Neusäß, DE
- "XV. Gimnazija "Zagreb, HR.

Students participating in this project are expected to be aged between 15-18 years and to have a basic knowledge of geometry and trigonometry.

The project has a transdisciplinary **aim**: to show students that a unity of the world and knowledge exists.

Today, the interest for maths and sciences is still low. This project will make students more motivated and will stimulate the students' creativity. Mathematics will become for them a basis with which they can understand the other sciences. The students will see the links between the disciplines and every day life. They will learn to access, collect, investigate, and interpret the information they find. The transdisciplinary activities will help them understand, communicate, evaluate and collaborate in order to find the solutions. This project offers the students the opportunity to be creative and innovative.

The main **objectives** are:

- developing students' interrogative abilities through challenging activities and motivating them in order to follow a career in maths or science (making them more attractive)
- sharing experiences and good practice by European cooperation

We want to apply Möbius strip in topology, ICT, physics, astronomy, chemistry, biology, literature, music and religion, in art, games and labyrinths, even in every day life. We are convinced that this project will prove that the transdisciplinary approach of teaching and learning is possible in a real school. Searching for truth and finding the answer contributes to the creation of a “complete person”.

Our strategy is to cooperate and communicate effectively between the schools using a variety of ICT facilities (video conferences, Skype, MSN, e-mails, Moodle) and exchange visits, involving workshops and cultural/scientific documentary. We want to involve the pupils in planning and implementing the project activities, thereby developing a collegiate relationship of cooperation between participants in partner countries. It will allow both staff and pupils to be involved in monitoring progress and success.

**Results:** Exhibitions with Möbius products: Möbius conveyor belt and Klein Bottle (one sided and boundless!), craft workshop products, essays, poems, posters.

**Dissemination:** To create a common web site and a DVD containing photos and videos from our activities and meetings, publishing a brochure with our feelings and thoughts, articles and books.

## 2. Plymouth, UK, September 23-25, 2011 (the first meeting)



from left to right: Mrs. Fotini Morris, Mrs. Eva Spalj, Mrs. Liliana Negrila and Mrs. Carlette Sandu (the coordinators)

In Plymouth we organised the whole activity of the project and we made up a questionnaire to help us to evaluate it.

We planned all our project meetings and we discussed the financial reports.

### 3. Neusäß, DE, October 16 -23, 2011 (the first project week)

We all met at the Munich airport on Sunday, October 16, in the afternoon. Ms. Carlette Sandu organized a transfer to Neusäß. When we arrived in front of the school, the students were picked up by their hosts and the teachers went to the hotel in Augsburg they were staying in. The first night our host organized a dinner in Ratskeller where we met the head of the Justus von Liebig Gymnasium, Mr. Ernst Weidel and two colleagues, Mr. Michael Barth (English teacher) and Mr. Sebastian Kirscher (maths teacher).



The first day we met at the school. After a very warm welcome from the head of the school Mr. Ernst Weidel and the coordinators, the students started working in groups.



The first task was to make a Möbius strip and to cut it in different ways, with different numbers of cuts. They had to investigate what happens and record it systematically. At first, they were restrained but they discovered something unexpected was happening. It was funny, a lot of colourful strips.

After a short research in the computer lab, they made PP presentations on the life of Möbius.



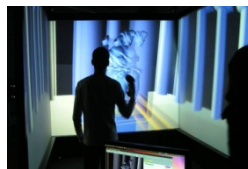
In the afternoon we started our tour. First we visited Schulpforta, the birthplace of Möbius. A former Cistercian monastery is now a celebrated German public

boarding school, called Landesschule Pforta, with around 300 high school students. We spent the night in a hostel in Leipzig.

On Tuesday we visited the Faculty of Mathematics and Computer Science in Leipzig, where Möbius was a student and a famous professor. Prof. Dr. Kürsten held a lecture on the life and work of August Ferdinand Möbius. He also showed us an interesting application of the Möbius strip, the love test.



After a short sightseeing tour of the city we continued our trip to Berlin. Some students and teachers were welcomed into a laboratory of the DFG Research Centre Matheon 3D. We saw 3-D printers that print 3D objects, a scanning system that uses triangulation to digitalize 3D objects. The most exciting was the cave, an immersive projection system that consists of three screens with rear projection. We could investigate the polar bear Knuts head from inside, walk on the Moon, or visit a Greek temple. Later in the evening we took a “light seeing” tour as Berlin was sparkling: Brandenburg Gate, Potsdamer Platz, Berlin Cathedral and many other buildings were illuminated.



The next day, on Wednesday, we visited Jena. First we went sightseeing, and afterwards visited “Imaginata”, an Experimentarium for the senses: place of learning, training lab, science centre and gallery all at the same time. In the Station Park we experienced physical experiments and perceptual phenomena. Some students “experienced” the movement of Möbius strip on



a small rollercoaster, riding a bike on a wire and many other interesting tests.

On Thursday, on our way back to Neusäß, we stopped in Nurnberg. The beautiful fountain (Schöner Brunnen) is considered one of the attractions of the city. The forty-colored painted figures of the fountain are famous philosophers, evangelists and religious heads of churches, amongst the others the statue of Pythagoras.



Our next station was Augsburg. On the guided city tour we visited the Augsburg Rathaus, one of the most impressive town halls in Germany. The Golden Hall is a magnificent hall with its splendid golden portals, coffered ceiling and wall paintings. Another interesting location was Fuggerei, the world's oldest social housing complex still in use. It was founded in 1516 by Jacob Fugger the Younger (known as "Jacob Fugger the Rich") as a place where the needy citizens of Augsburg could be housed. The rent was and still is one Gulden per year (equivalent to 0.88 €), as well as daily prayers for Jacob Fugger. In the evening we returned to Neusäß and the students went back to their host families, whereas the teachers were accommodated at a hotel.

On Friday we went to the school. The students investigated in groups the application of Möbius strip in physics, biology and chemistry. They found various interesting examples on the internet and presented them to the others. We also set up a competition for the best presentation. Two groups received certificates. After that, each group



had to write down some questions about Möbius and the activities from the whole week for the quiz "Who want to be Mr. Möbius?". We prepared prizes for all the students because



they were all very enthusiastic. At the end the students filled evaluation sheets, to reflect on the whole project week.

On the last day of our project week we visited the recycling collection point in Neusäß (the recycling logo is in fact a Möbius strip). We saw how many kinds of glass, paper, metal, plastic, textiles and electronics is collected and separated. They also collect food and garden waste for composting. Afterwards we went for a trip to a nice town of Ulm, and visited the cathedral with the highest tower in the world. During the Second World War Ulm suffered heavy bombing and over 80% of the medieval city centre was in ruins. Most of the city was rebuilt in the plain and simple style, but some of the historic landmark buildings have been restored. The old Fischerviertel (fishermen's quarter) on the River Blau, with half-timbered houses, cobblestone streets and picturesque footbridges is charming.

After all this wonderful time spent together it was hard to say goodbye. But, on Sunday we travelled back home. The project is going on; there are a lot of tasks to do before we meet again in Plymouth in March 2012.



On each mobility, the students have to circle the appropriate number for each item:

	<b>NOT AT ALL</b>			<b>DEFINITELY</b>	
<b>The work was interesting</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>I understood the tasks</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>I found the task useful</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>I enjoyed working in the group</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>I was engaged in the work process</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>The way we worked was appropriate for my level</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

**Germany, October 2011** (the results):

<b>The work was interesting</b>	<b>4,25</b>
<b>I understood the tasks</b>	<b>4,26</b>
<b>I found the task useful</b>	<b>4,15</b>
<b>I enjoyed working in the group</b>	<b>4,79</b>
<b>I was engaged in the work process</b>	<b>4,35</b>
<b>The way we worked was appropriate for my level</b>	<b>4,21</b>

- The project week in Germany was interesting, because the whole Comenius team met for the first time. It was a very enjoyable time. I felt great, because we all talked to each other and exchanged everything we knew about the other countries. I appreciate the time spent together, because I learned to speak English better and how to work on a presentation in the group. I enjoyed working in my group and finding aspects about Möbius' biography and the application of the Möbius strip in the different parts of science like biology, chemistry and physics. (Marc Bullach, DE)

- This project is only at its beginning and it has a few more weeks to get through, but I hope that it will be at least as good as this week was for me. (Veronika Vrhovec, HR)

- This was one if not the most interesting experience of my life. Spending time with foreign students, with foreign cultures was not only very educational but also exciting and very much fun. (Andreea Sabadus, RO)

- It was very good to work in mixed groups with pupils from every country. It was easier to understand your task if another pupil explained it to you. Working in groups was funny and you also got to know each other better. (Felix Gloger, DE)

- I learnt a lot of Maths while in Germany and found the Imaginata and Berlin 3D Lab, really interesting, I learnt a lot about general mathematics as well as learning about optical illusions, physics, chemistry and biology. I had an amazing week and loved getting to know the Romanians, Germans and Croatians and shared so many wonderful memories with so many wonderful people! I miss everyone so much! (Molly Dowrick, UK)

- I really loved the week. Seriously, I liked everyone from the team! By the way, thank you, guys, for this incredible week, I hope it was fun for everyone! (Elena Brächer, DE)
- The order, cleanliness, elegance, stylishness, respect for the others that I saw everywhere I went made me understand the so-called "German Spirit". (Giliano Bazili, RO)
- The whole project week was a completely new experience to me and I enjoyed every second of it. (Michael Stark, DE)
- We had a documentary visit at the Imaginata science museum, which was very interesting. We played around with our senses and learned a lot. One of the exhibits consisted of train tracks in the shape of a Mobius strip. It had a small cart on it which you could ride; it was great fun. We saw that after two rounds a person wound up in the same place where they had started. With this we proved (even though we already knew) that a Mobius strip has only one side. The Imaginata museum had a lot of other great exhibits. (Dora Hipsa, HR)
- The exhibition Imaginata in Jena was interesting. Everyday phenomena were explained in an easy and simple way. Also funny things like the giant chair and table were exhibited. (Viktoria Keller, DE)
- I enjoyed the fact we stayed with a German family as I learnt lots about the lifestyle and typical meals, though I didn't expect so much sparkling water! (Bethany Oxnam, UK)
- It was very interesting to meet other people from other countries. I had not been able to try to speak English with people who are not from Germany, before. (Jonas Baudrexl, DE)

- The best thing for me was the chance to practice my English and German with almost everyone I met. Everything was great! (Stjepan Budisa, HR)
- I think that we had a good team spirit, otherwise we wouldn't have laughed so much during the bus rides. (Benedikt Keitel, DE)
- For me this meeting is a unique moment in my life, a moment that firstly and more importantly brought me great friends (Roxana Unc, RO)
- I'm really looking forward to the next video conference to see all people again because I really enjoyed the week together and I'll never forget these 7 days in my life. (Nicolas Dubitzky, DE)
- I am very proud of the experience in general, particularly the in-depth knowledge I gained about Möbius, his life and also life in Germany and even some of the language. I also gained invaluable life experience and feel more confident about accessing international relations in the future. It was great to meet a variety of new people from different cultures and who all have different views on the world. (Georgia Lindsey-Swaffield, UK)
- The teachers were really friendly and it was great fun to join a week with them and the other pupils! (Thilo Brandmayr, DE)
- I'm especially looking forward to continuing working on the project because now comes the part where we research and explore by ourselves. Who knows where it will take us in the next two years? This project most certainly had an exquisite start. (Nika Prugovecki, HR)

- That week was truly amazing. Unfortunately it had to end. For some it was very difficult to say goodbye to all new-found friends. I've met lots of interesting new people and made lots of friends. I have also learned some things that might come useful later on and, most importantly, had a great time. The project is far from over, though, and I'm sure we will have many more beautiful memories. (Matej Vilic, HR)

- I can't say that anything of the week was boring or not interesting because everything was special in its own way. In conclusion, it was a very interesting and instructive week and I'm looking forward to seeing one of the other countries and the other participants of the project. (Andreas Brechtel, DE)

- The people who were there were really fantastic, it was great to speak English with them and before I took part in this project I was a little bit scared about the communication. (Armin Straller, DE)

- Overall, everything was so much fun and I found it a pity that it was only a week. (Andreas Herb, DE)

- Looking back, I wish that the next project week will come soon and I hope it will last longer than one week. (Schmiedler Thomas, DE)

- Friendship, good mood, students, both teachers and parents were all satisfied. All these were woven into the magic Mobius strip on the first great meeting in our Comenius project. It was a good start! (Liliana Negri, RO)

- This initiative has been extremely interesting for us because:
  1. We met some really special people. We were very happy to see that our partner schools have truly wonderful teachers, from whom we learned a lot.
  2. We now had exposure to the German education system and we were impressed with the variety of opportunities students have to prepare for university, the diversity of projects within schools, and also the high standard of the German schools (specifically the facilities such as laboratories, classrooms, canteen etc)
  3. We were impressed by how dedicated and keen the students were towards this project
  4. We particularly appreciate the high professionalism illustrated by our hosts in organizing the events and by how welcomed we felt. We would like to thank everyone for this.(Octavia Potocean, Mircea Potocean, RO)

- My name is Simona Arsenov, I am a physics teacher at “Moise Nicoara” National College in Arad, Romania and I’ll tell you what represented for me the visit in Germany:

- An opportunity to work in an international team, all together, students and teachers, Croats and English, Romanians and Germans.
- A reason to see a lot of interesting places like Schulpforta, the place where Möbius was born, the College of Schulpforta and University of Leipzig, the places where Möbius studied.
- A chance to visit a lot of beautiful cities in Germany: Berlin, Nurmberg, Ulm, Augsburg, Jena
- An extraordinary week.

#### **4. Plymouth, UK, March 10-17, 2012 (the second project week)**

We all met in London near London Eye on Saturday, March 10, at 6 pm. The Croatian group had just arrived from the airport while the other groups had arrived earlier and had spent the day sightseeing. We stayed overnight at YHA London Thameside.

Ms. Fotini Morris prepared booklets for each student to take notes and record important information from the whole project week.

On Sunday we visited the Science Museum. Impressive science collections contain instruments that have made science such a pervasive and powerful element in modern culture. The Mathematics Gallery combines instruments used by mathematicians with beautiful models illustrating mathematical principles. What was especially interesting for us and our project was the exhibition of models such as Platonic solids, colorful uniform polyhedra, topological models and surface models, as well as the Möbius strip and the Klein bottle.



Möbius strip in Science Museum

After visiting the Museum we travelled to Oxford. Oxford is known as the "city of dreaming spires", a term coined by poet Matthew Arnold in reference to the harmonious architecture of Oxford's university buildings. For over 800 years, it has been a home to royals and scholars, and since the 9<sup>th</sup> century an





established town, although people are known to have lived in the area for thousands of years. Buildings in Oxford demonstrate an example of every English architectural period since the arrival of the Saxons, including the iconic, mid-18th century Radcliffe Camera, The Christ Church etc. Our guide Daniel, a student of Byzantine History, showed us all the important places and told us a lot of interesting stories about students' life.

On Monday morning we visited the Mathematical Institute at the University. Dr. Richard Earl held a lecture on topology, Platonic solids and the Möbius strip. He showed us a map of London Tube and connected it with the graph theory.



By investigating models of Platonic solids constructed with JOVO Click 'N Construct toys, students discovered Euler's formula. At the end he explained the structure of mathematics; from pattern spotting to generalization abstraction and application.



On our way to Plymouth we stopped at Stonehenge to admire the famous Neolithic monument which represents a Sun calendar or a star arrangement (no one is really sure). How it was built really remains a mystery.



In the evening when we arrived in Plymouth, the students were picked up by their hosts and the teachers went to the hotel they were staying at.



The next day we met at the school. After a very warm welcome from the Deputy Head Teacher Mr. Thomas, students and some of the teachers went lesson shadowing. It was really an interesting

experience for all of them.

After lunch we went sightseeing, Ms. Morris and her daughter guided us through this lovely city.

On Wednesday we visited the Eden Project. The Eden Project



was built in a 160-year-old exhausted china clay quarry near St Austell, in Cornwall. It is a botanic garden with a Rainforest Biome and a Mediterranean Biome, containing over a million plants from around the world to teach the

visitors about man's relationship with nature.

In the educational center Core students attended an interesting workshop called "The Chocolate Chain". Divided into teams they investigated the path from cocoa bean to chocolate, identified the problems (exploitation of pure people, pollution of soil...) and came up with a suggestion for a piece of artwork that will send a message to visitors.

On Thursday we visited the University of Plymouth. First we went to the Planetarium where we watched short films about fractals, universe and 3D animation.

Afterwards, Dr. Paul Hewson, Associate Professor in Statistics held a lecture about statistics expectation. The students were

throwing “unfair” dice, recording scores and calculating the expectation. Another problem was conditional probability where the Bayes formula was introduced.



The next lecture was Balance a Body by Dr. Ted Graham. The students were involved in some experiments showing the state of equilibrium. They enjoyed all activities at the Plymouth University.



On Friday we stayed in the school. First we presented the activities we did with our groups at home. Afterwards the students, divided into groups, worked on presentations about the project week: London, Oxford, Eden Project, Plymouth University and Highlights of the Week. These were presented on a final conference in front of the Head Teacher, some teachers and students. Certificates were awarded for the best presentation and the best booklets.

After all this wonderful time spent together it was hard to say goodbye. The partners from Romania left on Friday evening, while the Croatian and German group travelled to London together to catch a flight on Saturday afternoon.

That was a really great week!



## England, March 2012 (the results)

<b>The work was interesting</b>	<b>4,69</b>
<b>I understood the tasks</b>	<b>4,59</b>
<b>I found the task useful</b>	<b>4,41</b>
<b>I enjoyed working in the group</b>	<b>4,94</b>
<b>I was engaged in the work process</b>	<b>4,81</b>
<b>The way we worked was appropriate for my level</b>	<b>4,25</b>

- From March 10<sup>th</sup> to March 17<sup>th</sup> 2012, students from Germany, Romania and Croatia were hosted by their exchange partners from Devonport High School for Girls. All together we smiled, had fun and exchanged various opinions and thoughts during an entire week which was full of new experiences, excitement and all sorts of trips around Southern England. We all made unbreakable friendships and bonds that will never fall apart. (Mario Canic, HR)

- In the week spent in England multiple connections and friendships were created, both among teachers and students. All of us had the same program and spoke the same language. For a week, I felt that I belonged to a big group of friendly and lively people. Each day was totally different from the ones before and we did not get bored at all. We visited lots of new places and garnered utilitarian information. (Alina Negrila, RO)

- The trip was amazing and we all still talk to each other, and hope to remain friends. This experience is one I'll never forget! (Bryony Pearce, UK)

- This project week was one of the greatest weeks of my life. It has enabled me to practice the English language, meet many wonderful people and different cultures. I feel grateful for having had an opportunity to participate in this project, while looking forward to October and the next project week. (Dalibor Žgela, HR)

- Looking back on things, I realize now that this week has made us better, an improved version of us, because of the things we got to experience. "The Cocoa Bean Project" taught us how to sustain our point of view, how to market our ideas. The Science Museum was an occasion to get to know the world better, and us, too. The Eden Project shows how humanity can make beautiful things out of unordinary situations. The London Eye is a lesson in pursuing your dreams, as the architect wasn't allowed to built it at first. Oxford is a place you can fulfill your dreams. England, all in all, is a beautiful country! (Andra Jivan, RO)

- My mind was immediately put at ease when we first met all of the exchange students. They were all very friendly and talkative and spoke amazingly good English. I soon came to like all of them and immediately felt comfortable around them. (Freya Swabey, UK)

- We all had an amazing week. The experience with the host family was great and they made me feel like home. (Bogdan Popa, RO)

- The Comenius week taught me many things: to be creative, work in groups, speak English; I saw a beautiful country that I had not seen before, I met interesting people. (Dominic Vidović, HR)

- I had a fantastic week and I really hope to be able to go to Romania and see them again because I made friends this week who I'm still in contact with and will never forget. I just want to thank everyone who was a part of the week because I had a great time. (Fran Spree, UK)

- I think that week was an opportunity to meet special people from lovely places and to make new friends who do not take into account the distance between us. (Ioana Stan, RO)

- I made many friends that I would never forget. Hopefully, one day I will be able to meet them all again. The experiences I have had were totally unforgettable and I hope to continue to enjoy this project until the end. (Ellie Drage, UK)

- Without any doubt, meeting Alina and all the other exchanges was the biggest highlight of the trip. I still keep in touch with Alina and hopefully will continue to in the future. (Harriet Westcott, UK)

- The week spent in England was one of the best trips of my entire life! The British people are very nice and kind and England is a beautiful country. I want to say: „thank you!” to all the organizers, teachers, students and all the people who made this possible. I hope that the students from each country will have a good time here in Romania because it is a beautiful country too. (Robert Gal, RO)

- When I unashamedly burst into tears upon having to say goodbye to Nina at the train station the following morning, it made me realise just how fortunate I was to have been involved in the project and to have made such a fantastic friend that I most certainly will be keeping in regular contact with for years to come. (Jasmine Love, UK)

- The lectures at the Plymouth University were about mechanics and probability. The professors were really good at achieving their goal – making it interesting. (Fran Stanisic, HR)

- It truly was an incredible week, full of memories I will treasure and cherish for my lifetime. I hope to stay in contact with everyone for many years to come! (Molly Dowrick, UK)

- I would like to say that I am very glad that I was given the opportunity to participate in this meeting because it was a lifelong experience I will never forget. I learned many new things there and made wonderful friendships. Those seven days were definitely one of the best days of my life. (Nina Dobrovic, HR)

- My exchange partner from Croatia, Dominic, was fascinated by the differences between our school and his own back in Croatia. From what I understood, Dominic's view on his academic career was very focused and determined for success. This has inspired me to follow a similar path in my studies. (Tess Ashen, UK)

- We spent a wonderful week! Both students and teachers were excited! We worked together for the project, being involved in many interesting lessons and we saw magnificent places! Students had exceptional Power Point presentations. They also

spoke about their everyday life and shared their dreams. During the last four days of the week, they stayed at English families and felt like being members of it. For us, teachers, it was a real opportunity to meet our old friends and to make new ones. We had time to share information about our educational systems and speak about our families back home. Hopefully, the friendship between us is getting stronger and stronger.

As a parent, I'm glad that I can work in the same project with my daughter. I was very proud of her when the other students, teachers and a host mom came to me and told me good things about her. (Liliana Negrila, RO)

- What has the mobility from England mean for me ? A very interesting and pleasant experience, a chance for me to meet some very nice and kind people, an opportunity to see some very interesting places, an opportunity to have other connections not only with our students but also with other students and teachers. So, everything from this mobility was something extraordinary. Beginning with London, followed by Oxford (a really wonder for me), Stonehenge, Plymouth and Eden project and everything that happened there was something really nice. Finally, I can say only that I hope to come again to England, and also I hope that I will meet these nice people again. (Ovidiu Bodrogean, RO)

- The activities that we took part in were very interesting, the kind of experiences that change your way of thinking, much more creative. Communication was also the main focus of the project. Students from different countries worked jolly well together and their work and the final presentations were really remarkable. We, teachers, cooperated together very well and we always had the feeling that we were one team. I am sure that the relationships between the participating schools will continue even after the project ends. (Cristina Crisan, RO)



## 5. Zagreb, HR, October 13-20, 2012 (the third project week)

All the teams arrived during the day and were heartily welcomed by students and the teachers Ms. Spalj, Ms. Antolis, Ms. Mavracic and Ms. Copic. Students' host families took their host children with them whereas the teachers were taken to a hotel they were staying at.

The first evening, organized by the Croatian teachers, was spent in a lovely restaurant, where the program for the following days was explained.

On the next day, teachers and students met at school in order to go on a trip to the Museum of Krapina Neanderthals. The museum is situated on Husnjakovo hill, a paleolithic site in the western part of Krapina. Opened in 2010 the modern museum offers researches palaeolithic excavation sites in Croatia as well as short history of the world since the Big Bang. The students enjoyed the highly interesting exhibits a lot and gained insight into the lives of Neanderthals. After a typical Croatian lunch with a variety of delicious traditional dishes it was time to visit Trakoscan castle, built in the 13<sup>th</sup> century and formerly owned by the noble family Draskovic. Today owned by the Republic of Croatia you can find a museum with amazing collections on permanent display.

On Monday we had the chance to experience the Croatian school from the inside. After a very warm welcome by the headmistress Ms. Veronika Javor and her staff the students followed their hosts to their classes while the teachers participated in lesson shadowing in various courses. Afterwards a city tour, guided by the hosts, began so that students got to know each



other and the city of Zagreb better. Zagreb is the capital and the largest city in Croatia located in the northwest of the country.

Back at school we watched a highly entertaining self-made comic drawn on a Möbius Strip by the Croatian students about its idea of a closed circulation. After a short introduction about complex numbers, students got together in groups in order to experiment on the Möbius transformation by using the computer. The most fascinating graphics were then exhibited in the hall.

Tuesday began with a little longer trip. After having met at school, the Comenius team got on the bus to the Plitvice Lakes, the oldest national park in Southeast Europe and the largest national park in Croatia. Since 1979 part of the UNESCO World Heritage register, the park is world famous for its 16 lakes and numerous waterfalls.



The next stop was Opatija, the city with the longest tradition of tourism in Croatia. The very attractive geographic position, beautiful scenery and pleasant climate attract tourists from all over the world. In the evening, however, we didn't go the beach but went to Rijeka in order to visit the Planetarium of the city. There we first watched a very informative movie about the development of space exploration starting with Galileo Galilei and the invention of the telescope. Afterwards we listened to a lecture about our solar system, where the different sizes of the space objects were illustrated in a very colourful way. Later everybody had the opportunity to look at the stars by using a big telescope. We spent the night in the historical scenery of the Hotel Opatija.

On the next day we left Opatija for Motovun, a charming city located on the top of a steep hill. Since 1999, Motovun has hosted the international Motovun Film Festival for independent and avant-garde films from the U.S. and Europe.



Our next stop was Porec, a city that is almost 2000 years old and that was first inhabited by the Romans. In order to get to know the city better, the hosts organized a paper chase that led us through all parts of the beautiful city. The main and most amusing task was to exchange a self-made Möbius Strip for other objects. Having the Croatian students organize the guided city tours in Porec as well as in Motovun was a well-planned activity and excellent idea of their teachers, which showed us what a great team they are.



Thursday morning was spent at the Faculty of Science – Department of Mathematics. There we listened to an introduction about knotty knots and their various forms. Using ropes and our own arms we were challenged to work on knots and answer tricky questions about them. Although the tasks of Prof. Dr. Sc. Franka Miriam Brückler were very demanding, everybody enjoyed the time at the faculty very much. The workshop motivated us to keep working on the mathematical approach to the theory of knots, which is not easy to understand by only using the maths curriculum.



In the afternoon we were separated into two groups. One group went to the Technical Museum of Zagreb, where impressive experiments with electricity were shown and where students



were given the chance to participate. Of particular interest were Nikola Tesla's significant inventions in the field of electrical engineering and the biography of the Croatian physicist. During the trip through an impressive mine built and situated in the basement of the museum we learned a lot about the history and development of mine engineering and its security aspects.



The other group went to the Museum of Contemporary Art, enjoyed a short introductory overview and was later encouraged to create pieces of art connected to the Möbius Strip.

In the evening Ms. Javor invited all project teachers and some other members of her staff to a typical Croatian dinner at a wonderful restaurant. It was a great opportunity to talk about differences and similarities of the participating schools and countries.

Friday morning was used to work on various presentations



about the sights that had been visited during the week. The results were then presented in front of the whole Comenius team and additional members of the audience. The students put a lot of effort into their presentations so that the results were stunning. In the meantime the German team presented their report about

recycling in the participating countries, the English team talked about the Möbius Conveyor Belt and a project homepage still being under construction. The Romanian team focused on the importance of international friendship and gave a DVD - containing the previous results of the project - to every participant.

The students who performed best in the paper chase in Porec even got prizes.



At the end the students were given evaluation sheets to reflect on the project week. Eventually, every female student and teacher received a rose from the Croatian students, who wanted to thank all female participants in a very charming way. In addition, at the official farewell all guests were again plentifully presented.

On Saturday it was time to say goodbye – the most difficult task of the week as everybody had enjoyed the week a lot and did not feel like leaving.

However, it is comforting that the project hasn't ended yet and that all the participants keep in touch.



## **Croatia, October 2012 (the results)**

<b>The work was interesting</b>	<b>4,52</b>
<b>I understood the tasks</b>	<b>4,55</b>
<b>I found the task useful</b>	<b>4,43</b>
<b>I enjoyed working in the group</b>	<b>4,48</b>
<b>I was engaged in the work process</b>	<b>4,59</b>
<b>The way we worked was appropriate for my level</b>	<b>4,70</b>

- On the morning of 13th October 2012, we started our amazing journey towards Croatia. Maybe one of the most interesting things was that we were hosted there; that way, we got to see their habits, and spend that week just like them. For one week, be Croatians...(Sara Luiza Bic, RO)

- It was a very interesting and exciting week for everybody. We made new friends and I hope I can see everybody again. (Andreas Brechtel, DE)

- The week was a real success and I enjoyed every bit of it. (Ellie Drage, UK)

- It was the best week, because I really had a good time discovering new things and making new friends. (David Bacos, RO)

- The work with the students from three other countries was funny, although some parts of the workshops were very confusing, especially the knotty mathematics lecture. But although we didn't understand everything, we still enjoyed it a lot. (Christian Heynck, DE)

- I had an amazing time in Croatia for several reasons: I made so many new friends and I am going to miss them all greatly, it was a beautiful country with loads to do and see, and it was a new experience that I shall never forget and I shall cherish the memories forever. (Freya Swabey, UK)

- The mesmerising week in Croatia during the Comenius project was exactly that, 'mesmerising'. The fair amount of beneficial knowledge, beautiful sightseeing and a company to match the previous; these are the key words which can briefly describe this experience. Moreover, the cultural boundaries we crossed, the rather strong connections formed and the memories that will be our companions for the rest of our lives are some things that everyone from the experience can pride themselves on. (Catrinescu Oana, RO)

- All in all, I really didn't feel like going home. It was such a pleasure to spend time with students from other countries, make friends and learn a lot about different cultures. I am very thankful for having the opportunity to participate in the Comenius project since it is something I will certainly remember for the rest of my life. (Marcel Kremser, DE)

- It was sad to say goodbye, but we were all glad that it had been an amazing week during which we had learnt a lot and made lots of new friends! (Katerine Salter, UK)

- I have the opportunity to reflect on how fantastic the week was and how lucky I was to have had the opportunity to go on the exchange, which I would definitely recommend to anybody as the experience really opened my eyes about daily life in other cultures in a way that a holiday abroad couldn't ever compare to. (Jasmine Love, UK)

- The week spent in Croatia was an amazing experience. I was very happy to go there, not only for the chance of meeting new people and learn stuff about Croatia, but also because I like the idea of going in a country where English is the only language to communicate with each other. I find it a good way of improving my English speaking. (Laura Gligor, RO)

- The project work topics were very interesting. We visited the University of Zagreb and had an astonishing lecture about knots there. But even better – in my opinion – was the “lesson“ about complex functions like the Möbius transformation. (Max Reif, DE) - For me it was really great to experience some traditions of Croatian people and I also learned a lot about their way of living. Of course it's another way of living than in Germany. In my opinion, they eat much more than in Germany and they have a much more relaxed attitude than people in Germany have. I also saw many sites of Zagreb, which is the biggest city in Croatia. (Thilo Brandmayr, DE)

- Every day spent in Croatia brought new challenges with it, as well as happy feelings. With our friendly hosts, we followed the tracks of the Croatian history, we saw the beauty of the country and we tasted the best of their traditional dishes. I don't think I will ever be able to forget the beauty of the visited places. Above all, I liked the people, our new friends, who knew how to offer us a wonderful time, to maintain high spirits. (Crina Dascal, RO)



- What did the week spent in Croatia mean for me? It was an opportunity to meet new great people, to find out more about their habits, to make new friends, to visit wonderful and unique places and to discover the Croatian education system. (Arsenov Oriana, RO)

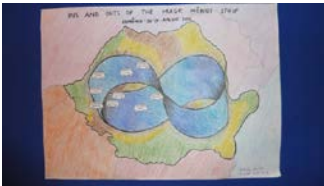
- What made the project week very enjoyable, besides all the places we visited and the activities we did, was talking to the others, getting to know them better and even learning something about their home countries and spending time together in general. Because of all these things, the project week was an unforgettable experience to me. (Michael Stark, DE)

- Now, after a while, the thing that I remember the best is our visit in Porec. Even now I can see myself sweeping the narrow streets in searching of some monument buildings about which we had to take some notes. I was working with people that I had encountered a few days ago... and I was counting on them. (Patrik Stepan, RO)

- It was a very great week with very nice experiences and very nice people from all countries. (Nicolas Dubitzky, DE)

## 6. Arad, RO, April 20-27, 2013 (the fourth project week)

Our fourth exchange visit started in Arad, on Saturday, April 20<sup>th</sup>. The Croatian team had arrived the night before by train, whereas the UK team started travelling on Friday afternoon, and after an overnight stay at Luton airport, arrived at mid-day. The German team arrived in the afternoon.



On Sunday 21<sup>st</sup> we started on a three day a research trip around Transylvania. The Möbius strip was our guide.

Our first stop was Corvin Castle which was built in 1446. Built mainly in Gothic style, it also has additional Renaissance architectural elements. It features tall and strong defense



towers, an interior yard and a drawbridge. Built over the site of an older fortification and on a rock above the small river Zlaști, the castle is a large and imposing

building with tall and diversely-coloured roofs, towers and a myriad of windows and balconies adorned with stone carvings.

Next we visited the ancient city of Alba Iulia. This began as a



Neolithic hill fort before becoming a Roman fortress; then a medieval citadel against the armies of Europe. Now the Old Town is a living museum, with cobbled streets and a drawbridge to enter. At the end of

World War I, representatives of the Romanian population of

Transylvania (the exact number is disputed between Romanian and Hungarian historians) and representatives of the Transylvanian Saxons gathered in Alba Iulia, on 1 December 1918 (celebrated as the National Day in post-communist Romania), to proclaim the Union of Transylvania with the Kingdom of Romania, where Romania was made a democratic country in 1918.

We stayed overnight in the beautiful city of Sibiu, where the next morning we had a guided tour discovering the existence of secret chambers underneath the main square for storing corn and a post studded with nails, representing all the journeying carpenters who passed through Sibiu to gain experience.



In tandem with the city of Luxembourg, Sibiu was designated a European Capital of Culture for the year 2007.

We spent lunchtime in the historic city of Sighisoara, one of the oldest citadels in Europe and the birthplace of Vlad the Impaler. On the top of the hill, we visited a beautiful old school, still in working order, full of ornate architectural features and decorated with a great number of classical quotes. The students set out on a treasure hunt, to find various monuments like the Tower of the Tailor's Guild.



The next morning we headed underground, into the amazing vast salt mines of Turda Salina. The absolute age attributed to the salt



deposits from Transylvania is 13.6-13.4 million years. The salt sedimentation took place in isolated marine basins in warm and wet climate. Salt was first extracted here during the antiquity and the mine continuously produced table salt the Middle Ages to the early 20th century. Since 1992, *Salina Turda* has been a halotherapy centre and a popular tourist attraction.

We spend Wednesday at school, “Moise Nicoara” National College. After a very warm welcome by the Principal, Mr. Mircea Potocean, the students started working on various activities related to the Möbius strip.



They constructed their own Klein bottles using materials such as plastic, plasticine, clay and wire.





They worked together and they proved they are able to communicate and collaborate in order to find solutions.

We organized an exhibition with Möbius products: Klein bottles, craft workshop products, a jigsaw puzzle and paintings.



These works offered the students the opportunity to be creative and innovative.



The teachers attended several lessons given by Romanian colleagues, an experience which they found really beneficial especially in comparing curriculum content and pedagogic methodology.



Camelia Circa Chirila, teacher of Romanian and Zoltan Lovas, a local actor, created high spirits among students. They organized six fun games and they entertained all participants.

After lunch, students were warmly welcomed by the mayor of Arad and then they found the beauties of the town situated on the Mures river with the help of the competition “Treasure Hunt”. Photos of pretzels and nature were expected, as well as romantic photos and poems.



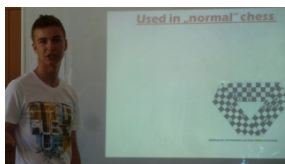
There was no let up for the Comenius group; that afternoon we went to the “Lunca Muresului” National Park where we learned about the local ecosystem and the students also took part in activities such as tree climbing and cycling. Everyone enjoyed the beautiful natural site and the warm weather.



On Thursday, we visited the University of Timisoara where we had an interesting and challenging lecture on the application of mathematics in gambling and biology. Mr Gabriel Istrate, Ph.D Associate Professor, was our teacher. A number of students were lucky enough to see the super computer Blue Gene. In the afternoon we had a tour of Timisoara and visited the Victory Square, where the people rose up to overthrow the Communist regime in 1989.



We spent Friday in school. In the morning the students worked in mixed nationality groups to prepare their presentations. They created PowerPoint presentations and videos for their activities. Within the framework of the “Tiberiu Popoviciu” International Conference of Mathematics, the students presented both their work done together in the Romanian project week and some aspects of the activity each of them performed



in their own school throughout the whole school year. All the results will be published in the second electronic book produced as part of the multilateral Comenius project Inns and Outs of the Magic Möbius Strip, the title of this book being **THE KLEIN BOTTLE, A NEW CHALLENGE**.



A number of other presentations were also shown, including a hilarious entry from the German team: ‘Who Wants To Be Mr. Möbius?’



A relaxing atmosphere and high spirits were permanently present during the festive dinner on Friday night as well. The general cheerfulness and the dance consolidated connections between participants in the project, providing once more that, although belonging to different nations and cultures, the students can have common interest and concerns.





It was a fantastic week, well organised, informative and fully enjoyed by everyone. On Saturday 27<sup>th</sup> it was very hard to say goodbye to each other, as, by this stage in the project, we all feel like a big family, students and staff alike! We are all looking forward to our final meeting in Germany in June, where, like the Möbius strip, we will complete the loop and end our project (sadly!).



**Romania, April 2013 (the results):**

<b>The work was interesting</b>	<b>4,39</b>
<b>I understood the tasks</b>	<b>4,72</b>
<b>I found the task useful</b>	<b>4,31</b>
<b>I enjoyed working in the group</b>	<b>4,61</b>
<b>I was engaged in the work process</b>	<b>4,50</b>
<b>The way we worked was appropriate for my level</b>	<b>4,39</b>

- It is true that Romania is not a rich country, but the people living there have a relaxed, open-minded and friendly attitude and are very emotional. The project group and I think Romania, in general, will forever be in my heart. (Armin Straller, DE)

- What I liked the most about the program in Romania was the nature reserve near Arad where we could ride on the rope in the air like Tarzan....And I have to commend the girls who made the game Treasure Hunt because we had so fun completing those tasks, taking pictures, and socializing with people in the international groups...There is no possible way to thank

enough to those genius minds which made this project actualize... (Tea Tomkic, HR)

- Although I am Romanian, I had the opportunity to see and learn new things in my own country. As usual, we perfected our knowledge of the Möbius strip in a delightful atmosphere, while also making friends and having a good time. (Tamas Papp, RO)

- The time in Romania was magnificent, veličanstven, magnificent, großartig. The reason was the perfect mix of history, science and common leisure time. (Jan Rindle, DE)

- I was really pleased with the general interest people showed for what things are like in the other teams' countries, how people live their lives there and so on. Even though we came from such different backgrounds, we got along really well and enjoyed each other's company... I made some amazing friends and learned a lot. This experience has given me something words cannot describe. It is an insight into this world, the people in it and I even felt that I got to know myself a little better. It was a week I will never forget. (Ivana Kinder, HR)

- It was fantastic and I think that's the best thing during the project: to work in mixed groups and meet new people from other countries. (Thomas Martinek, DE)

- We learned many things, especially about friendship and how a European project can open our minds. (Bogdan Popa, RO)

- Overall, the trip was such a good experience and I feel very privileged to have had the opportunity to go. I have had so many new experiences and learnt so much. (Harriet Westcott, UK)

## FEELINGS – ROMANIA, APRIL 2013

### **1. What new things did you learn during the multilateral Comenius project Ins and Outs of the Magic Mobius Strip about:**

#### **a) yourself:**

- I started understanding German – bits and pieces (Stefania Dumulesc,RO)
- I learnt that I can develop myself in another way, which is different from the classical school-related environment. (Oana Catrinescu, RO)
- How to manage money over a fixed time and how to budget for a holiday (Maskall Daisy, UK)
- I'm awesome, as usual☺. I've learned that I couldn't live in such a small place. I love it for a week but not more than that. I've learned that I don't appreciate enough what I have! (Tea Tomkic, HR)
- During the Comenius Project I learned that I am a more talkative person and I am more capable of doing things that I want to do than I thought. (Oriana Arsenov, RO)
- I learned that I can more than I think I can, if I really try. (Bogdan Popa, RO)
- I realize how happy travelling and meeting new people makes me. I have become aware of my need to see as much of the world as I possibly can. (Ivana Kinder, HR)
- That I am more capable of doing things that I want to do and should be doing. That I am very self-disciplined and decide on my own. (Giliano Bazili, RO)
- I've learnt how to be independent. I love travelling and seeing the people side of the country not just the touristy side. (Rhianon Smith, UK)

- I am good at making new friends. I love travel. (Katie Corbett, UK)
- Be proud about my country; make compromises; be myself, not be fake. (Andreea Sabadus, RO)
- Not to judge the people you don't know. I've learned to communicate better with non-speakers of Romanian. I can be a friendly person when I am in a good mood. (Laura Gligor, RO)
- I learned a lot of things, especially about the Mobius Strip in maths and science. I (hopefully) improved my English. (Thomas Schmiedler, DE)
- I'm actually quite good at rowing; how to be good with money. (Rachael Kundriel, UK)
- I learned that I can't want more from a person than I want from myself. (Roxana Unc, RO)
- How to be more independent with travel and money, etc. (Fran Spree, UK)
- I have discovered a new side of myself a side which totally has a desire for discovering new wonders. (Mihai Atimut, RO)
- In this project, I learned about myself that I can also communicate well enough in English with the other students from it. I have learned that I can also work in teams and that I am more sociable than I have ever thought. (Roan Arsenov, RO)
- That my English is quite bad....but fortunately I have the chance to improve my English here. (Benedikt Keitel, DE)
- My English became a lot better, because at school there isn't enough time to spend talking so much (we only write). I could make new friendships with students of other countries and sometimes that's really funny. (Jessica Bauenbach, DE)
- I have practiced my English a lot since I started taking part in the Comenius project. My English was bad and is still bad in comparison to how good it should be. (Jan Rindle, DE)
- I might be more sociable than I first thought. (Tomi Papp, RO)

- I learned how to work better in my group. I learned also that I can be really friendly and that I am a good host. I also discovered some of my talents. (Sara Delic, HR)
- To be more responsible and work better in groups; to use and recognize my advantages and to help others if they have any problems with understanding something. What's most important, I've learned to be more patient and understanding. (Mirta Cuk, HR)
- How to communicate with people that I do not know. I have a friendly personality. I can be impatient sometimes. (Cristina Siclovan, RO)
- I found that I am able to work in teams formed by members from different countries. (Patrik Stepan, RO)
- I learnt something about the Romanian history and the good powers of a salt mine which help people with diseases. (Marc Bullach, DE)
- I have a problem when it comes to meeting deadlines sometimes. I love socializing and meeting new people. (Sara Bic, RO)
- I found out that I'm more of a talkative person than I imagined. I'm proud because I could show many interesting places from Romania to other people, from other countries. (Claudia Barabas, RO)
- I learned that I like team work and meeting new people. (Crina Dascal, RO)
- Being responsible (Alina Negrila, RO)
- That I like travelling and meeting new people; about how other people see me; that I like non-conformism. I can be responsible. (Andra Jivan, RO)
- I like travelling more than before this project. I am a sociable person. I like working. (Robert Gal, RO)
- My English is bad but I think I have improved my speaking since I have been taking part in the Comenius Project. (Thomas Martinek, DE)

**b) people (in general):**

- Even though we come from different countries we are all very much alike. We all love having a great time, games, jokes, we all have same interests and problems. (Stefania Dumulescu, RO)
- People, although they are from different countries, are very much alike. We, teenagers, have the same interests, ideals and visions. Well, not exactly the same, but similar. (Oana Catrinescu, RO)
- That you can always agree for a compromise (Maskall Daisy, UK)
- There are nice people in Siria, that's a really small place but has more humanity than all big cities in the world. I was walking around and everybody smiled and said: "salut!" even though they don't know me. These people don't have much. They don't have many shops. They don't have much money. They don't have many clothes. But they have more than I'll ever have. It's really not about having the biggest house or the best car. We always lose our compasses sometimes. But I think I found mine, thanks to Profest. Now I see it's not about the money, there are more important things such as friendship or lying on the ground surrounded with flowers and enjoying nature! (Tea Tomkic, HR)
- I learned that every country has their own mentality and we don't react in the same way in different situations. (Oriana Arsenov, RO)
- You can find nice people in the most unexpected places and some people aren't the persons you would expect them to be. (Bogdan Popa, RO)
- I learned that people being different from one another is a really good thing. We all came together to form a very diverse group and showed each other an admirable amount of respect. In this modern world we are more connected than ever before and this is the generation for which international corporations will be of crucial importance. (Ivana Kinder, HR)

- How to communicate well; how to explain complex things in simple ways; how to defuse intense emotions; how to make people feel valued and respected. (Giliano Bazili, RO)
- How other people live and all about other cultures. (Rhianon Smith, UK)
- How people in other countries live (food, houses, etc.) (Katie Corbett, UK)
- They are very open-minded and sociable, friendly, love to share their experiences, love to discover new things. (Andreea Sabadus, RO)
- You have to accept people for what they are and you have to try not to judge them. (Laura Gligor, RO)
- I learned that it's possible to make really good friends in such a short time (one week). (Thomas Schmiedler, DE)
- Can often get along. (Rachael Kundriel, UK)
- I learned that people are the ones who make me smile when my life is boring. (Roxana Unc, RO)
- I learned that you can make friends for life just in a few days. (Ioana Stan, RO)
- That despite being from different countries and cultures we can co-operate and be friends. (Fran Spree, UK)
- I have learnt that, no matter the nationality, religion, hobbies or preferences a project will always unite people, creating new relationships between each other. (Mihai Atimut, RO)
- People can communicate despite the different mentalities and countries where they come from. We are all at the same age and it is very well that there is no discrimination between us. (Roan Arsenov, RO)
- In my opinion, Romanians are very friendly (Benedikt Keitel, DE)
- The Romanians are really friendly and it's so interesting to learn something about their traditions and so on. (Jessica Bauenbach, DE)

- People have a lot in common, it doesn't matter where they come from or which language they speak. And if you spend time together you will find this out. (Jan Rindle, DE)
- We don't all react the same way in different situations. (Tomi Papp, RO)
- Young people are not so different even though they come from different countries. Lots of people have similar interests. (Sara Delic, HR)
- Every single person is different and no one reacts the same in challenging situations. No one has the same habits. We all worked together despite the differences and managed to socialize and be productive. (Mirta Cuk, HR)
- Not to judge them at first sight. You have to listen and try to speak in whatever language you can and you can understand and be understood. (Cristina Siclovan, RO)
- People can learn new things more easily if they apply them in their life. (Patrik Stepan, RO)
- I saw that there are many friendly and nice people who will help you if you need help but I also saw the poor people who have to live on the streets. (Marc Bullach, DE)
- You can't say something about all the people in a country, because it always depends on the person. You have to find a connection with the ones around you, but not everyone fits anyone. (Sara Bic, RO)
- People from Germany, England and Croatia are more open minded than we are, but we are more relaxed. (Claudia Barabas, RO)
- About people, I learned that they can get on well and do amazing things together despite the differences of language and culture. (Crina Dascal, RO)
- Working together doesn't mean only efficiency, but fun as well. (Alina Negrila, RO)



- Other cultures are interesting. Team work is good, but also hard. Friendship can emerge out of pretty much anything. (Andra Jivan, RO)
- People are very sociable irrespective of their native country. (Robert Gal, RO)
- In comparison to the people living in Germany, the Romanians are much more friendly. (Thomas Martinek, DE)

**c) life:**

- I love seeing the different aspects of each nationality. Croatians are friendly, Germans are punctual and hard working and the English know how to have fun and still do their job as a student. I can learn how to socialize from Croatians, discipline from Germans and relaxing from the English. (Stefania Dumulesc,RO)
- Life should be lived as if there was no tomorrow! This is just what this project has shown by doing so many diverse things each day. And also given the fact that the experience is so short we are bound to cherish each moment spent together. (Oana Catrinescu, RO)
- Lots about the history and culture of Transylvania and some about Romania in general (Maskall Daisy, UK)
- I've learned many German and Romanian words and met really kind people. I had the best birthday party ever and made friends. I'm sure I'm going to see them again. (Tea Tomkic, HR)
- In life we should get involved in as many projects as we can, because we can develop ourselves and become more sociable. (Oriana Arsenov, RO)
- No matter what you do, life is a big Mobius Strip, where you can't get rid of the bad without getting rid of the good. (Bogdan Popa, RO)

- It is short and our goal is to leave behind a better world for the future generations. It is a never-ending cycle – that is what I think of when I see the Mobius Strip. (Ivana Kinder, HR)
- If you never doubt your beliefs, then you're wrong a lot. Most of what we see is only what we think about what we see. The greatest innovation in the history of humankind is language. (Giliano Bazili, RO)
- That I would love to carry on travelling and see lots of different cultures and countries. (Rhianon Smith, UK)
- What else can be discovered? (Katie Corbett, UK)
- Don't judge things before you get to know them. Everything has an inner beauty. Life is wonderful when you are not alone. These friendships we made came as a surprise to me, I couldn't imagine that we would get on so well. (Andreea Sabadus, RO)
- Life is a Mobius Strip however you watch it. (Laura Gligor, RO)
- I learned a lot about culture & lifestyle in Romania. (Thomas Schmiedler, DE)
- It is different for different people in different countries e.g., wants and desires. (Rachael Kundriel, UK)
- About life, I think life is a Mobius Strip, we live, we know that it will finish, but it will never finish. (Roxana Unc, RO)
- I learned that even if sometimes things go wrong, there will always come a day when everything would be alright. (Ioana Stan, RO)
- That in future I would like to continue travelling and seeing new countries. (Fran Spree, UK)
- Life is infinite like the Mobius Strip and also offers many exciting possibilities which shape one's future. (Mihai Atimut, RO)
- In life, we should socialize with as many people as possible and that we should always ask ourselves more and more things. (Roan Arsenov, RO)

- I noticed that the people from here are living in another culture, they are more relaxed here, not as strained as the people are in Germany. Furthermore, everything (but not the imported products) is very cheap here. (Benedikt Keitel, DE)
- I noticed that the Romanians are much more relaxed and in parks there are so many people who enjoy the sun for example, the atmosphere isn't strained like in Germany and it would be nice if in Germany there were a little bit of this feeling. (Jessica Bauenbach, DE)
- Life is too short for doing and experiencing everything. You have to decide, set priorities. You have to figure out what you really want to be. (Jan Rindle, DE)
- Three hours of sleep are not enough. (Tomi Papp, RO)
- You can't judge people by their physical appearance, because lots of them will surprise you positively once you get to know them. (Sara Delic, HR)
- One should make the best out of every opportunity in life because you do not know what it offers unless you try it yourself. (Mirta Cuk, HR)
- You have to accept everyone in order to make new friends. (Cristina Siclovan, RO)
- In our life we should try to meet as many people as we can. (Patrik Stepan, RO)
- In Romania the motto for life is: We have time. Everything is relaxed. (Marc Bullach, DE)
- People are not here to be judged, but to be loved and accepted. There are so many things we know nothing about. (Sara Bic, RO)
- It's short, try to live it while you can and it's very important to get involved in as many activities/projects as you can. "Life's a climb, but the view is great!" (Claudia Barabas, RO)
- When it comes to life, I learned that the best of life comes with trying new things and also by continuous learning. (Crina Dascal, RO)

- Life's so much nicer when you share it with others. (Alina Negrila, RO)
- It's good! (Andra Jivan, RO)
- We make our future and life and we choose how we live our lives. We have to choose well and think well when making a choice. (Robert Gal, RO)
- The people in Romania are more relaxed. (Thomas Martinek, DE)

## **2. Which are the questions you ask yourself now that you have learned about the Mobius Strip?**

- How big is my potential? (Stefania Dumulescu, RO)
- How can I use my knowledge of the Mobius Strip in everyday life?

What about the whole Universe? If it goes on and on just like the Mobius Strip, how can it be infinite? (Oana Catrinescu, RO)

- Is there more architecture based on Mobius? How much does it show up in Escher's art work? How did Mobius himself discover the strip – a challenge he was set, an interesting curiosity, a flash of inspiration? (Maskall Daisy, UK)
- How can I use my knowledge in real life and different areas? (Tea Tomkic, HR)
- How can I use this knowledge? (Oriana Arsenov, RO)
- Which is my limit? (Bogdan Popa, RO)
- What can I do to contribute to making this world a better place for everyone who lives in it? (Ivana Kinder, HR)
- What can be discovered from different countries? (Rhianon Smith, UK)
- (Katie Corbett, UK)
- How can I “use” Mobius Strip more than the applications that we've made? What can I make/do “to change” the world as Mobius Strip's did? (Andreea Sabadus, RO)
- Should I have been more involved? (Laura Gligor, RO)

- I ask myself how the Mobius Strip is involved in everyday life. Thomas Schmiedler, DE)
- Why does it bring people together so well? (Rachael Kundriel, UK)
- How would my life be without such experiences? (Roxana Unc, RO)
- Will there be another life after we die? What will it be like? Will it be forever? (Ioana Stan, RO)
- When can we do the exchange again?!?! (Fran Spree, UK)
- Who or what established the term “infinite”? Is Mobius Strip related to the beginning of the Universe? (Mihai Atimut, RO)
- Where and how I can use the things I’ve found out in this project? (Roan Arsenov, RO)
- Will the Mobius Strip become a little bit more popular and will researchers find out more about it in chemistry, biology, etc.? (Jessica Bauenbach, DE)
- Is the Mobius Strip applied anywhere else? (Jan Rindle, DE)
- What can I use this knowledge for? (Tomi Papp, RO)
- Is this really the end? (Sara Delic, HR)
- What’s next? (Mirta Cuk, HR)
- Is there anything else that I could have learnt? Should I have done anything else? Was I a good friend? (Cristina Siclovan, RO)
- How can I use this information in computer science? (Patrik Stepan, RO)
- The biggest question is what can we do with it in the future? It may help me to solve problems but now I don’t know. (Marc Bullach, DE)
- What are we going to learn next? (Sara Bic, RO)
- When it comes to life, is it true that infinity begins where the finite ends? (Claudia Barabas, RO)
- I am wondering how many other original discoveries such as the Mobius Strip are out there waiting for us? (Crina Dascal, RO)

- Mobius' Strip is actually everywhere, it unites people, makes them cooperate, make things better. (Alina Negri, RO)
- Probably they are the same: what's the point of a continuous circle, of life? But I embrace life, with good and bad! (Jivan Andra, RO)
- Can the Mobius Strip improve nowadays technology? (Robert Gal, RO)



## 7. Neusäß, DE, June 12 -16, 2013 (the last project week)

We set off for Germany on Wednesday, the 12th of June, early in the morning. When we arrived there, we were awaited by the host families and the staff of the school.

The morning after, we encountered everybody in school. There were preparations of the four exhibitions and the work on the final report.

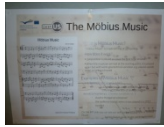


At half past one, there was a reception for teachers in the city hall of Neusäß. Mr. Hansjörg Durz, the mayor of Neusäß, presented us some important facts from the history of the city.



Between 17:00-19:30 the concluding event took place. The principal of Justus von Liebig Gymnasium, Mr. Ernst Weidl, delivered the welcoming speech and Mrs. Carlette Sandu played at the piano for us.





There followed the exhibitions:



Besides this, there was a very interesting plenary lecture, held by Prof. Dr. Wolfgang Reif, from the University of Augsburg. The topic was: `` On Ants, Fishes and Germany`s Energy Turnaround: Current Research in Swarm Intelligence``.



Friday, the 14th, brought us a pleasant surprise. On a 2-day research trip we visited some of the most fascinating and exquisite places in Bavaria.

The first on our list was Garching Research Centre. It is a city near Munich. It houses several research institutes and university departments, such as:

- Max Planck Institute for Astrophysics
- Max Planck Institute for Plasma Physics
- Max Planck Institute for Quantum Optics



Departments of the :

- research reactor
- mechanical engineering
- mathematics
- computer science



There is a constant flux of scientists visiting the city because of the many scientific experiments located here. A number of roads and places are named after scientists, mathematicians and technical innovators.

Our guides, Mr Angelo Limone and Mr Benjamin Ruf presented us the fascinating world of Plasma Physics. Mr Angelo Limone talked about ``stellarators``, which are experiments that will demonstrate how to create the energy of Sun, on Earth. They are basically capable of working in steady state. Amazingly enough, Möbius topology appears in such reactors. The Möbius strip assures stability in a system that is well-known to be physically unstable.



After we left the Research Center we headed for the BMW plant in Regensburg. Since its inauguration in 1986, the employees at the BMW plant have been doing their best to manufacture vehicles in a premium quality and to fulfill their customers` individul wishes. The area of the plant is 1.4 million square meters and the staff is approximately 9,000. The plant produces 1,100 vehicles per day. The production of a vehicle starts in the press shop. In the body shop, a complete car body is made up of about 550 components, depending on the type of car and variant. In the paint shop the bodies are given colour, shine and protection.

The assembly is the largest production field of the plant. Around 4,000 experienced employees complete the painted chassis for which 20,000 pieces are necessary in the assembly. This is mostly done by hand. The goals of the BMW plant are to build cars of the highest quality. Through the support of art, culture, sport, education and social engagement, the company provides an important contribution to the quality of life of the people in the surroundings of the plant.

We were really impressed by the efficiency of the company. After so many technical details we decided to take a break and visit the city of Regensburg. It is a wonderful city, in Bavaria. Its large medieval centre is a UNESCO World Heritage Site. Around 90 A.D., the Romans built a fort there. From the early 6th century, Regensburg was the seat of Agilolfing ruling family. It remained an important city during the reign of Charlemagne.

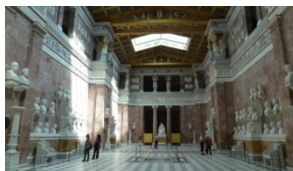
Since fourteen Bohemian princes came to Regensburg to receive baptism, the diocese of Regensburg became the mother diocese of Prague. Two of the most important sites of this city are: -the Stone Bridge, which was built between 1135-1146, played an important role in opening major international trade routes between northern Europe and Venice  
-Regensburg Cathedral, dedicated to St. Peter, is the most important church and landmark of Regensburg. It is the first example of Gothic architecture in Bavaria.



On Saturday morning we visited Walhalla. It is a reproduction of the Parthenon, built as a Teutonic temple of fame, on a hill rising from the Danube, at Donaustaf. It was erected by Ludwig I of Bavaria. The interior contains the busts of more than a hundred Germanic personalities.

Visible from far, the temple-like building of Walhalla rises out of the wooded slopes of the hill, just outside Donaustauf. The name ``Walhalla`` was suggested by Johannes von Müller.

According to Germanic mythology, Walhalla is the dwelling-place of the Gods, into which warriors chosen by the Valkyries may be admitted. King Ludwig decreed that all men and women of great achievement, both in time of war and peace, should be commemorated in the temple of Walhalla.



The architecture of the exterior is Doric in style and exudes classical severity.

If we had to make a comparison between Walhalla and the Möbius strip, we could say that the shape of the temple matches the strip. If you take one end of the strip and twist it, you get a loop , it is like going back in time, as in History.

Still thinking of Walhalla, we left for Kelheim. There, on a boat trip, upstream the Danube , we were impressed by the Danube gorge. Here the Danube has created a narrow gap through the chalk of the Franconian Mountains and the resulting gorge is one of the natural highlights along the river. We visited the Weltenburg



abbey, which was founded by Irish monks in around the year 600. It is one of the oldest in Bavaria. For almost 1000 years, beer has been brewed in Weltenburg and served in the beer garden in the abbey courtyard. Another famous aspect of Weltenburg is the late Baroque abbey church with its wonderful ceiling frescos and altar, which were created by the Asam brothers.

This was the final stop of our research trip into the heart of Germany. It made us think that learning more about other cultures, helps us understand ourselves better. Trying to overcome prejudices that we might unwittingly carry, and just accept them with a positive attitude, will actually make us feel better and more open towards others.



By having partners from different countries of Europe with different historical, political, educational and cultural backgrounds, we have found that working together has been absolutely essential to the quality of the outcomes. In the personal meetings, the partners brought in ideas and approaches that the other partners have not thought of, these discussions improving the quality of the outputs.



We will conclude this report with a quote:

``We are all citizens of one world, we are all of one blood. To hate a man because he was born in another country, because he speaks a different language, or because he takes a different view on this subject or that, is a great folly. Desist, I implore you for we are all equally human. Let us have one end in view, the welfare of humanity; and let us put aside all selfishness in consideration of language, nationality or religion``.

(COMENIUS)

## 8. The conclusions:

- In the beginning I was more than skeptical of whether anybody could make a whole project on "a twisted piece of paper" but I was definitely proven wrong. All of the exquisite teachers from four different countries made this a unique experience that I will never forget. The Möbius strip is not only a fascinating one-side three-dimensional object but it also afforded me one of the best adventures of my life. I got an amazing chance to meet interesting new friends from all over Europe that I still keep in touch with, to get acquainted with a completely new country and, most importantly, learn interesting new things in an unconventional way.

It's absolutely necessary to acknowledge and commend the effort that was put into this. I feel completely privileged and honored that I got to be involved in such an ambitious project that provides alternative teaching for students and manages to be as sophisticated and complex as a real science study while maintaining a certain amount of fun. (Nika Prugovecki, HR)

- The work in groups and the fact that we all hung out together made us feel like a real team. (Thomas Schmiedler, DE)

- Wow! What weeks! I got to know people from Croatia, Romania and Germany and had loads of fun playing cards and talking to them all. It was amazing to find out about the other student's schools, hometowns and countries and getting to know everyone and I loved learning the odd word of the languages! Smiles, tears and laughter at goodbye summed up an incredible Comenius week that I will surely never forget. (Molly Dowrick, UK)

- This project is a fantastic chance to get to know other ways of living and to see what other students in other countries have to do for school. Also, it was a nice chance to make friends from other countries. Another brilliant side effect of this week was to practice speaking English. At last, I would like to say that I'm really glad to be part of this team and that I was given the chance to participate and go to Croatia. (Thilo Brandmayr, DE)

- This experience was one of the best in my life. I will save all those memories and remember them all my life. I hope I will stay in contact with everyone I became friends with. That was a really great week! (Mario Canic, HR)

- In this project week I've learned more than so far in this school year. The ins and outs of the Möbius strip were very interesting and I was very astonished. It's very amazing that Möbius strip finds its application in Physics, Chemistry and Biology. I'm very interested in the things we will get to know in the further project. (Felix Gloger, DE)

- I am sure that for everyone it was a wonderful experience. I loved the way the family treated me and I loved the activities...I'm missing every moment and every person from the project. (Claudia Barabas, RO)

- I think such projects are great and they should be made at schools more often. (Andreas Herb, DE)

- The project is very useful and I think it serves its purpose, because I exchange letters with English girls now! (Viktoria Keller, DE)

- That's what this project has offered me: a completely new perspective on social bonds. (Patrik Stepan, RO)

- I love being able to meet people from all different backgrounds with completely fresh perspectives. I've gained many fun memories, some strong international friendships and of course a deeper knowledge of mathematics too! (Georgia Linsey-Awaffield, UK)

- On only hearing the words "Möbius-project", someone could believe that it has only to do with Maths, because Möbius was an amazing mathematician. But, in my opinion, it is not all about maths. With this exciting project you get to know people from different countries, in our case from Romania, Croatia and Great Britain. Moreover, when travelling around the respective countries, you learn a lot about their histories. Of course, you also learn a lot of maths, especially about Möbius' findings and particularly the best known of his "ideas", the "Möbius-strip".

If you are fond of maths like me, it is one of the best things that could happen to you. So all in all, for me it means learning and discovering new things. (Jan Rindle, DE)

- That feeling of excitement, joy, warmth and content can't ever be experienced again. It's a "once in a lifetime" experience and I am honoured to have been a part of this exchange. (Stefania Dumulesc, RO)

- I really enjoyed this week and I am very glad that I took part in it. I have learnt lots of things not only in Maths and Science, but also in the cultures of the different countries that participated. If the opportunity came up again, I would definitely seize it and I hope to visit them in their own countries soon. (Freya Swabey, UK)

- I most certainly recommend any of the Comenius projects to anybody; it has truly been an eye-opener and one of the most rewarding things I have ever taken part in in my life. (Jasmine Love, UK)

- All in all, it was a great project with great people. It was such a pleasure to work with like-minded persons and an unforgettable experience. Thank you! (Max Reif, DE)

- I have learnt so much not only about maths and science but about people from all around Europe, and this has not only challenged the way I think and behave but changed it. (Fran Spree, UK)

- That week was one the best weeks in my life. We got the opportunity to hang out with people from England, Germany and Romania. The whole point of the project weeks is to make friends with people from another country, not just learning. I also became better friends with people from my country that were with me in Romania and improved my English because I spoke English for almost the whole week...I didn't regret a second because those 7 days were simply amazing and I hope that I will meet my international Comenius colleagues at least once more. (Grigor Spalj, HR)

- We all realised the Mobius's strip actually finds itself in everything that surrounds us and in everything we do. This strip had even the power to gather us all together and due to it we made new friends... friends whom we'll never forget! (Alina Negrila, RO)



<b>WORDS IN FOUR LANGUAGES</b>			
<b>Romanian</b>	<b>English</b>	<b>German</b>	<b>Croatian</b>
Școală	School	Schule	Škola
Professor	Teacher	Lehrer	Profesor
Lecție	Lesson	Lektion	Sat
Pisică	Cat	Katze	Mačka
Câine	Dog	Hund	Pas
Salut!	Hello!	Hallo!	Bok!
Mulțumesc!	Thank You!	Danke!	Hvala ti!
Cu plăcere!	You're welcome!	Gerne!	Nema na ćemu!
Bun venit!	Welcome!	Willkommen!	Dobro došli!
La revedere!	Good bye!	Auf wiedersehen!	Dovidenja!
Te rog!	Please!	Bitte!	Molim!
Poftim?	Sorry? (What?)	Was?	Što?
Scuze!	Sorry!	Es tut mir leid!	Oprosti!
Noapte bună!	Good Night!	Gute Nacht!	Laku noć!
Fericit	Happy	Glücklich	Sretan
Trist	Sad	Traurig	Tužan
Obosit	Tired	Mude	Umoran
Excursie	Trip	Reise	Putovanje
Autobus	Bus	Bus	Autobus
Luni	Monday	Montag	Ponedjelsak
Marti	Thursday	Dienstag	Utorak
Miercuri	Wednesday	Mittwoch	Srijeda
Joi	Tuesday	Donnerstag	Četvrtak
Vineri	Friday	Freitag	Petak
Sâmbătă	Saturday	Samstag	Subota
Duminică	Sunday	Sonntag	Nedjelja



# THE MAGIC OF THE MOBIUS STRIP

Liliana Negrila  
- coordinator -



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## Table of Contents

1. Summary .....	3
2. Plymouth, UK, September 23-25, 2011 (the first meeting)..	5
3. Neusäß, DE, October 16 -23, 2011 (the first project week)..	6
4. Plymouth, UK, March 10-17, 2012 (the second project week).....	16
5. Zagreb, HR, October 13-20, 2012 (the third project week)	25
6. Arad, RO, April 20-27, 2013 (the fourth project week) .....	34
7. Neusäß, DE, June 12 -16, 2013 (the last project week) .....	55
8. The conclusions: .....	61



At the end of this project, there are some words which cross my mind, namely: friendship, good mood, understanding, well-done work, co-operation, cultural exchange. There were beautiful moments, full of joy, a period we will never forget. It has helped us understand better Maths through games and build a strong bridge between peoples.

Project coordinator: teacher Liliana Negrița

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