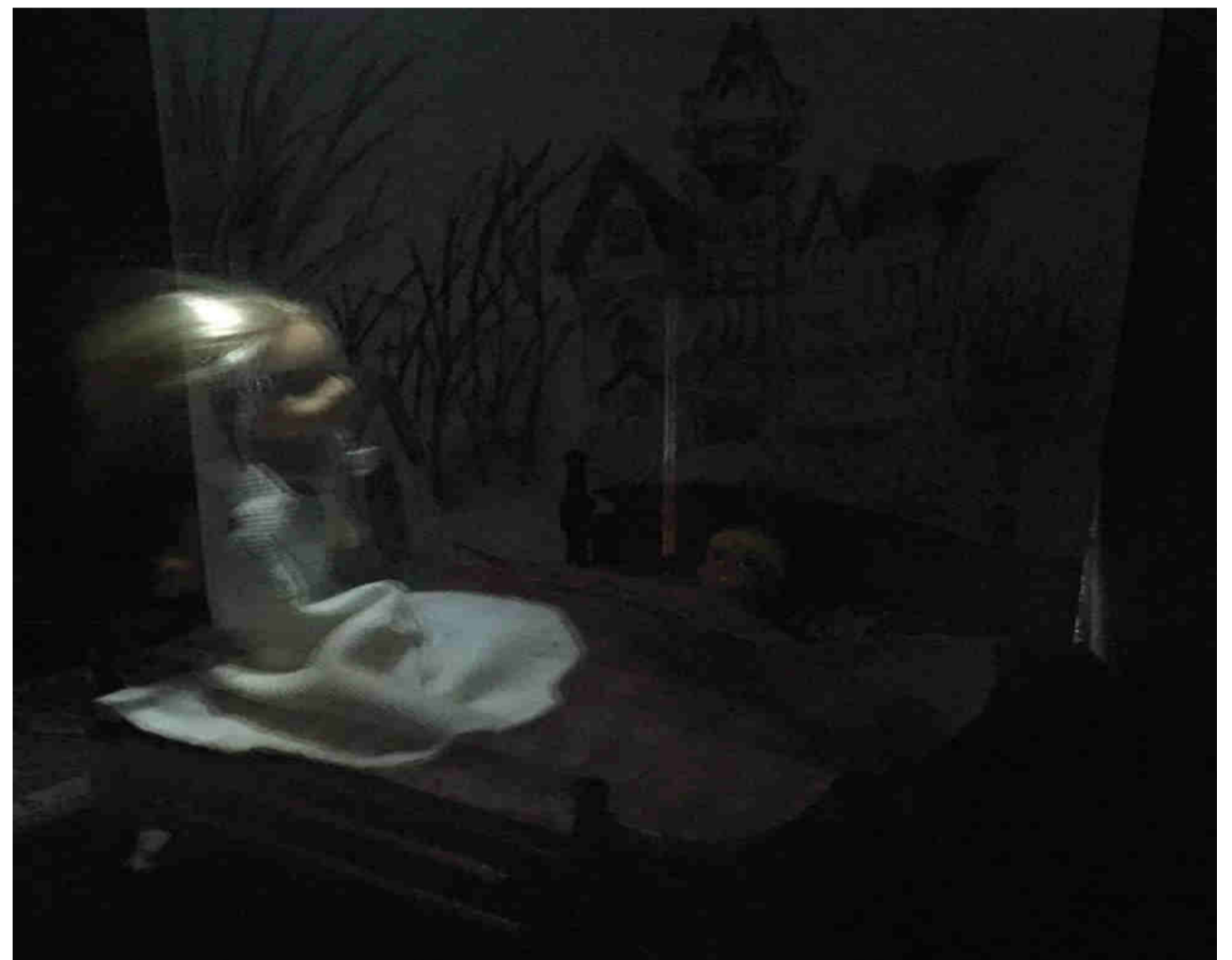


Nuria Muñoz & Silvio Rademaker | La Inmaculada School & Amadeus Lyceum |  
Algeciras & Utrecht | Spain & The Netherlands

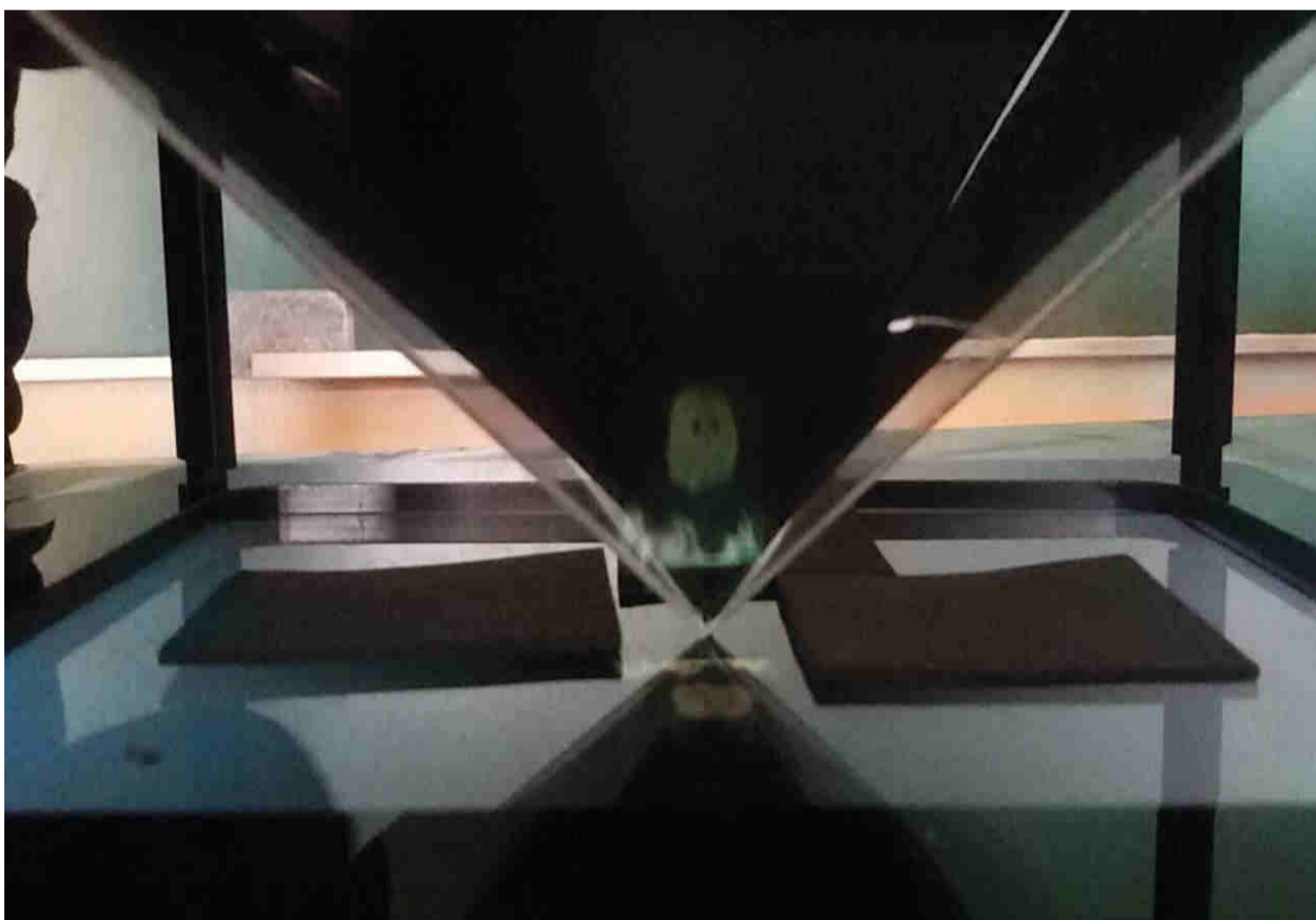
## Phantoms or Physics?

Ghosts, spirits and a long list of supernatural happenings have fascinated humanity as far back as we can recall therefore this Joint Project involves research into apparently paranormal and supernatural phenomena which can be explained by applying physical laws.

We've studied what the influence of literature and theatre had on the inventions and on the magic tricks during the 19 th century. We reproduced them in our labs and study the behaviour of light as a wave movement demonstrates the Physics behind every single invention or trick.



Pepper's ghost: partial reflection and transmission



Hologram? It's just a 2 D image instead of a 3 D



Ouija: an experiment in varying tension

100%  
Spooky!

All the experiments can be adapted for use in the classroom . "It's not magic, it's science we sometimes don't see!!!"



Damjan Štrus | Gimnazija Litija | Litija | Slovenia

Stephen Kimbrough | Dürer-Gymnasium  
Nürnberg | Germany

## Goal stock exchange Shoot to Thrill

calculate the whole number of games

calculate scored and let in goal statistics

calculate the average number of goals per game (for the whole season and per single team)

calculate the coincidence in the outcome of the games

Results of German 1st Bundesliga, season 2014/15

away team	Augsburg	Bayern	Bremen	Dortmund	Frankfurt	Freiburg	Hamburger SV	Hannover	Hertha	Hoffenheim	Köln	Leverkusen	Mainz	Monchengladbach	Paderborn	Schalke	Stuttgart	Wolfsburg	scored let in goals	scored let in goals home																			
1 Augsburg	0	4	4	2	2	3	2	2	0	3	1	1	2	1	0	3	1	0	0	2	2	0	2	2	1	3	0	0	0	2	1	1	0	43	43	28	21		
2 Bayern	0	1	6	0	2	1	3	0	2	0	8	0	4	0	1	0	4	0	4	1	1	0	2	0	0	2	4	0	1	1	2	0	2	1	80	18	46	7	
3 Bremen	3	2	0	4	2	1	1	0	1	1	1	0	3	3	2	0	1	1	0	1	2	1	0	0	0	2	4	0	0	3	2	0	3	5	50	65	25	24	
4 Dortmund	0	1	0	1	3	2	2	0	3	1	0	1	0	1	2	0	1	0	0	0	0	2	4	2	1	0	3	0	3	0	2	2	2	2	47	42	26	15	
5 Frankfurt	0	1	0	4	5	2	2	0	1	0	2	1	2	2	4	4	3	1	3	2	2	1	2	2	0	0	4	0	1	0	4	5	1	1	56	62	36	26	
6 Freiburg	2	0	2	1	0	1	0	3	4	1	0	0	2	2	2	2	1	1	1	0	0	0	2	3	0	0	1	2	2	0	1	4	1	2	36	47	21	22	
7 Hamburger SV	3	2	0	0	2	0	0	0	1	2	1	1	0	0	2	1	0	1	1	1	0	2	1	0	2	1	1	1	0	3	2	0	0	1	0	25	50	16	18
8 Hannover	2	0	1	3	1	1	2	3	1	0	2	1	2	0	1	1	1	2	1	0	1	3	1	1	0	3	1	2	2	1	1	1	1	3	40	56	21	25	
9 Hertha	1	0	0	1	2	2	1	0	0	0	0	2	3	0	0	2	0	5	0	0	0	1	1	3	1	2	2	0	2	2	3	2	1	0	36	52	17	22	
10 Hoffenheim	2	0	0	2	1	2	1	1	3	2	3	3	3	0	4	3	2	1	0	0	1	2	0	1	4	1	0	2	1	2	1	1	1	1	49	55	31	26	
11 Köln	1	2	0	2	1	1	2	1	4	2	0	1	0	0	1	1	1	2	3	2	0	1	1	0	0	0	0	0	2	0	0	0	2	2	34	40	18	17	
12 Leverkusen	1	0	2	0	3	3	0	0	1	1	1	0	4	0	4	0	4	2	2	0	5	1	0	0	0	1	1	2	2	1	0	4	0	4	5	62	37	39	15
13 Mainz	2	1	1	2	1	2	2	0	3	1	2	2	1	2	0	0	0	2	0	0	2	3	0	0	2	2	5	0	2	0	1	1	1	1	45	47	27	19	
14 Monchengladbach	1	3	0	0	4	1	3	1	1	3	1	0	1	0	2	0	3	2	3	1	1	0	3	0	1	1	0	0	4	1	1	1	1	0	53	26	32	14	
15 Paderborn	2	1	0	6	2	2	2	2	3	1	1	1	0	3	2	0	3	1	0	0	0	0	0	3	2	2	1	2	0	0	0	0	0	0	31	65	21	31	
16 Schalke	1	0	1	1	1	1	2	1	2	2	0	0	0	0	1	0	2	0	3	1	1	2	0	1	4	1	1	0	1	0	0	0	0	4	42	40	26	14	
17 Stuttgart	0	1	0	2	3	2	2	3	3	1	2	2	2	1	1	0	0	0	0	2	0	2	3	3	2	0	0	1	0	0	0	4	0	4	42	60	18	28	
18 Wolfsburg	1	0	4	1	2	1	2	1	2	2	3	0	2	0	2	2	2	1	3	0	2	1	4	1	3	0	1	0	1	1	1	1	3	1	72	38	38	13	
scored let in goals away	22	11	41	27	36	25	32	31	30	29	23	22	28	12	34	26	32	25																					
scored let in goals home	15	34	25	21	20	15	9	19	19	18	16	23	18	21	10	16	24	34																					

betting???

learning probability

compare the goal statistics with ranking on the final table

calculate the relative frequency of the number of goals per game

r=1m

2,44m

11m

5,5m

16,5m

5,5m

7,32m

16,5m

Christian Karus | Andreas-Vesalius-Gymnasium | Wesel | Germany  
Tom Toebes | Fontys University for Applied Sciences | Tilburg | Netherlands  
Dirk Hilbers | Crossbill Guides Foundation | Arnhem | Netherlands

## Simulation meets real nature

- ✓ Students aged between 13-16 have a close look at nature restoration project in a former gravel pit alongside the river Rhine
- ✓ Combination of practical and theoretical studies
- ✓ Students design a project on how the gravel pit is best restored and what kind of ecosystem can be expected to develop when the restoration project is completed
- ✓ With Ecosim (a Dutch simulation software) the German students first adapt the software to their landscape and then compare it with their documentation
- ✓ Students learn about land use, river ecosystems, nature conservation and restoration in the traditional way and in the modern way through simulation



The German group at the gravel pit



The area at the restoration project



Doing the planning with drawings

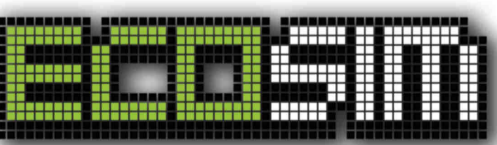


Creating the scenery with EcoSim



Starting the simulation with EcoSim

In this project students can see longterm ecological processes (e.g. succession) in a short time. EcoSim is an important help for students in understanding ecological processes and human intervention in a project to restore a gravel pit example.



School of Teacher Training for  
Secondary Education Tilburg

### Conclusion:

The combination of two projects offers students new insight into understanding their environment and ecosystem!

two  
in  
one

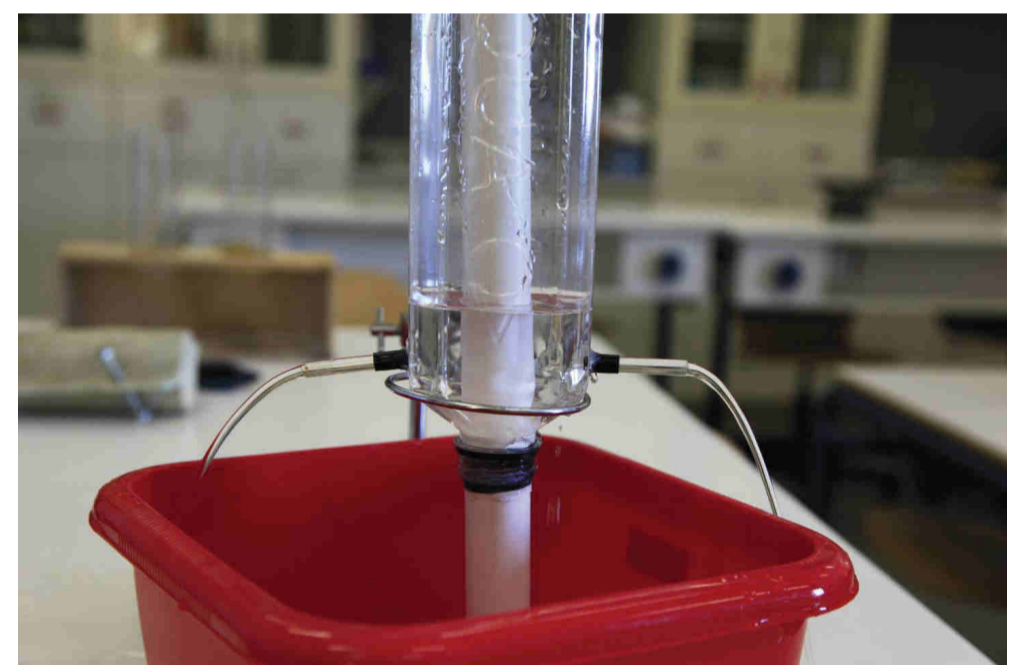
László Papp | Școala "Ioan Bob" | Cluj-Napoca | Romania  
Panagiotis Lazos | 26<sup>th</sup> High School | Athens | Greece

## Modeling of unusual natural phenomena - another way of learning Sciences

- The main aim of our project was to create functioning models of rare natural phenomena in order to raise the pupils' awareness for Science.
- We have challenged our pupils' curiosity by selecting rare and spectacular natural phenomena which apparently do not have a logical explanation like **intermittent springs** and **mud volcanoes**.
- Throughout the project we have adopted the Model-Based Inquiry strategy.
- The models were created by students from both countries in collaboration with their teachers and were presented at the Greek and Romanian SonS festivals in 2016.



Functioning Model of Intermittent Spring and Mud Volcano presented at the National Science on Stage Festival 2016 by peoples of the "Ioan Bob" School, Cluj-Napoca, Romania



Functioning Model of Intermittent Spring built by the pupils from the 26<sup>th</sup> High School of Athens, Greece

### Collaboration timeline:

June, 2015

- Meeting in London at the SonS festival

September, 2015

- E-twinning project: "Would you dare to bet?"

February, 2016

- Meeting in Athens, follow-up activity

October, 2016

Submission of the joint project

March, 2017

Erasmus+ project with 5 participating schools

100%  
Great!

Working on the project we have observed a significant increase of our student's interest towards Sciences. The Model-Based Inquiry also improved the pupil's communication skills.

Annamaria Lisotti IIS Cavazzi - Rui Baptista Esc.Secundaria3 Barcelinhos - Damien McDonagh St.Josephs Sec.School - Thomas Claussen Gymn. Papenburg | Erasmus+ KA2 | IT-P-IR-DE

## MoM-Matters of Matter

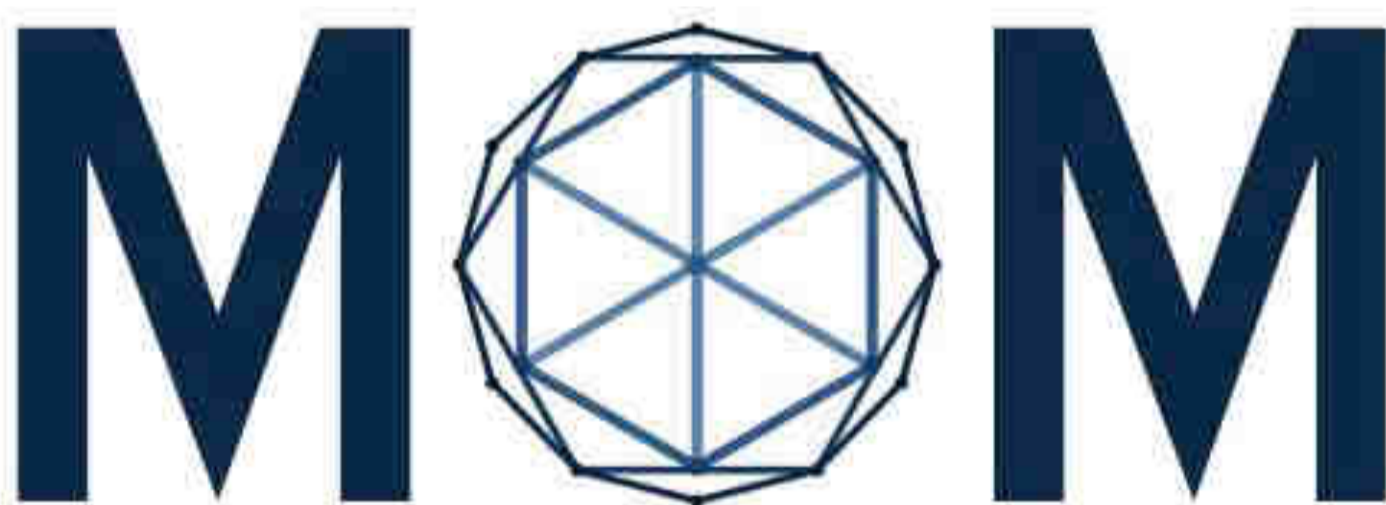
### Future Materials in Science Education



Using **new materials** to innovate Science didactics, enhance real research at school and unleash students' potential as innovators to tackle future challenges.

- Light interacting materials
- Internet of Things
- Materials for a Sustainable Society

Experimenting, Researching, Prototyping  
Inventing, Creating, Showing.



**Teachers Summer School** in Pavullo (Italy)  
21-26 August 2017 with science teachers from  
all over Europe.



#### Free Resources

- Experimental protocols
- Teacher Guides
- Students' Sheets
- Materials repository
- Presentations
- Videos



[www.mattersofmatter.eu](http://www.mattersofmatter.eu)

contact: [lisottiannamaria@gmail.com](mailto:lisottiannamaria@gmail.com)

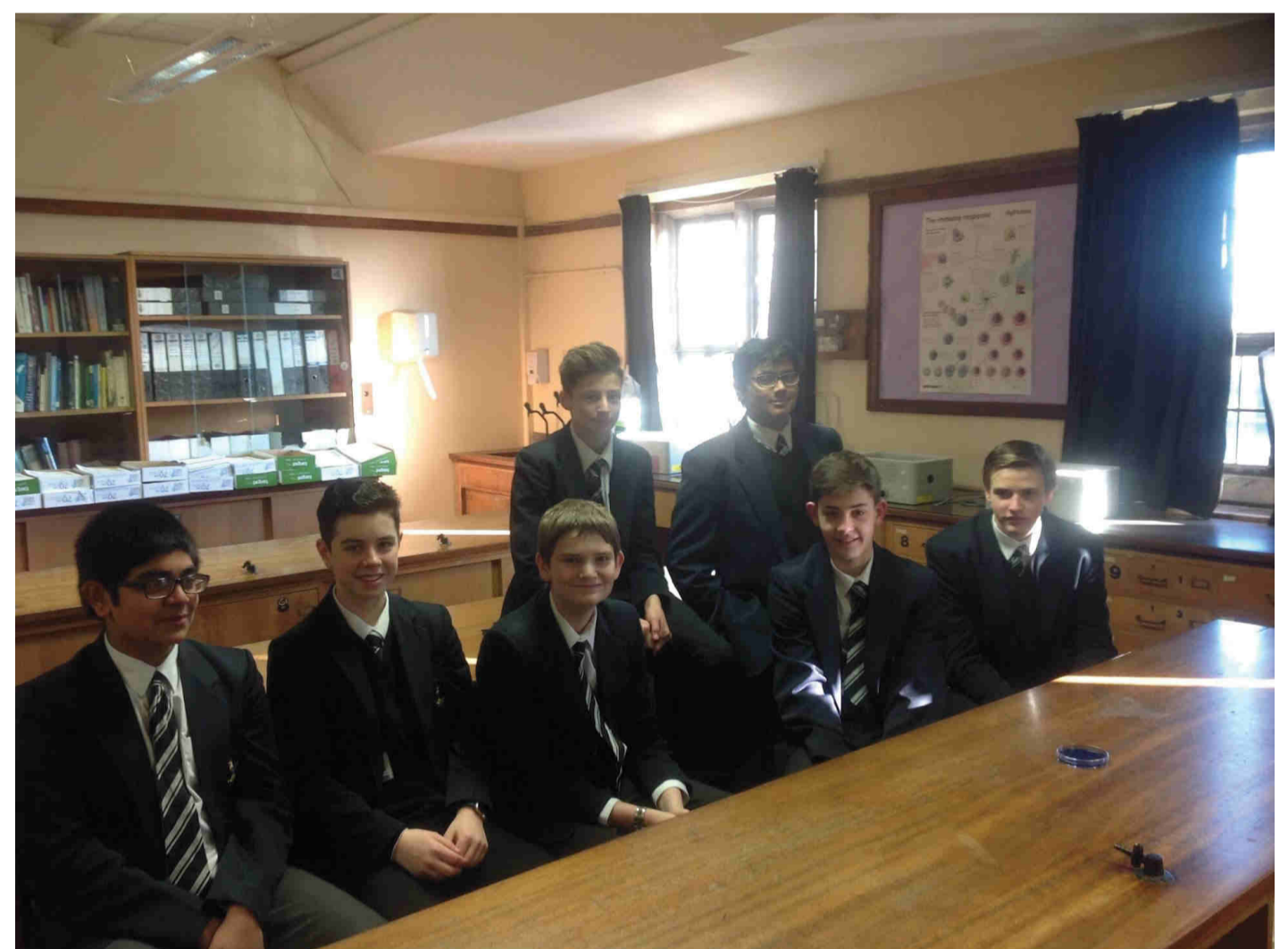
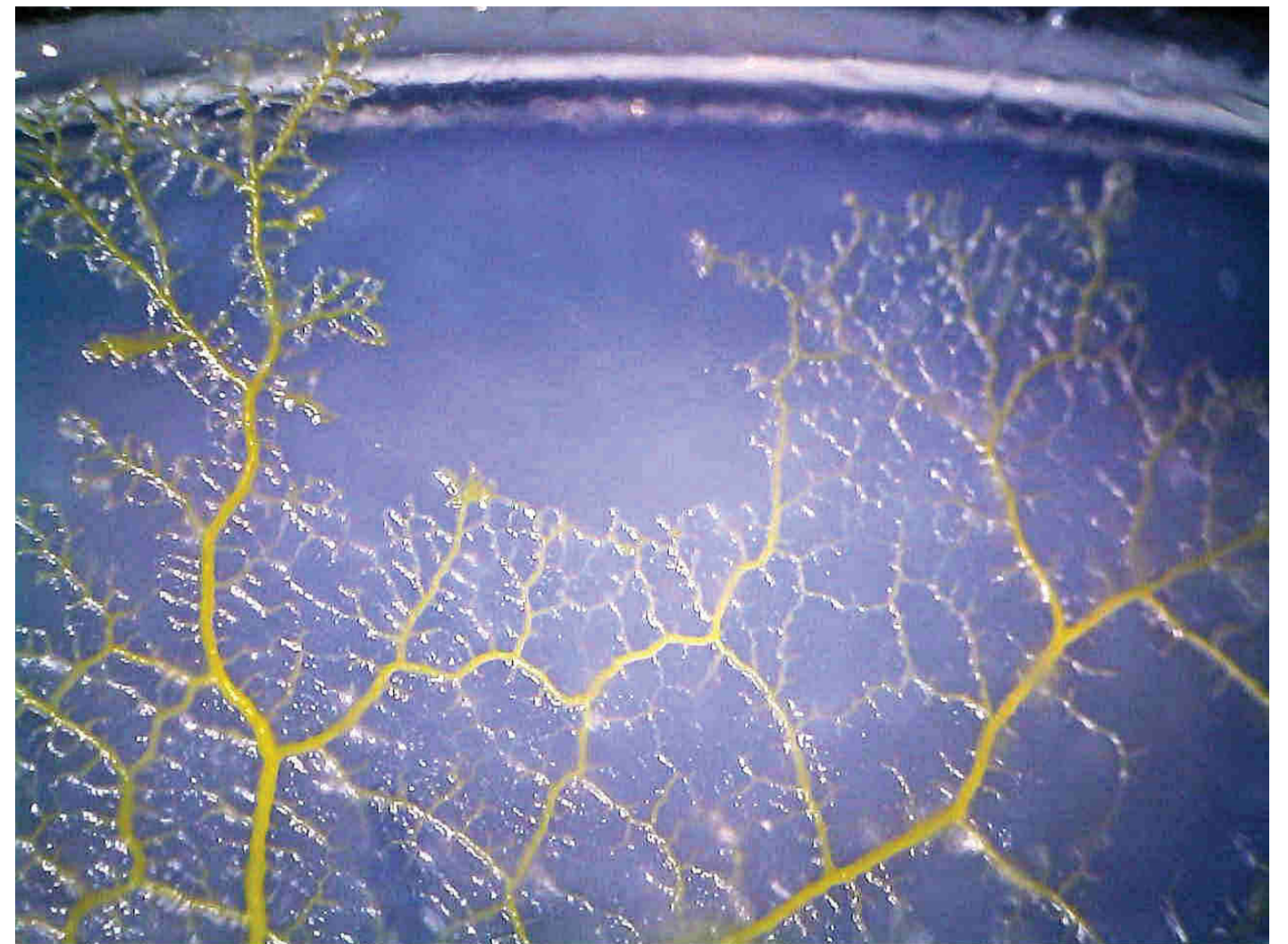
David F. Teasdale | Bolton School Boy's Division | Bolton | United Kingdom  
Hans Mulder | Jan Tinbergen College | Roosendaal | The Netherlands

## Is Slime Mould smarter than you?

### *Physarum polycephalum*

What is Slime mould? It is not a plant, animal or fungi yet its behaviour in seeking out food sources seems to suggest "intelligence".

Students aim to find out what the slime mould is responding to. They test their theories by designing experiments and attempting to manipulate its behaviour. Students learn about experimental design, aseptic technique (including pouring agar plates) and setting up time lapse photography.



*Above: Pictures from student experiments showing slime mould growth*

Can your  
students  
unlock its  
secrets?

- **Easy to grow & Low cost experiments**
- **A complete slime mould experimental kit available from our stand!**