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Magazine of Dispuut Geo-Engineering "De Ondergrondse"



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From the Board

Dear students, staff members and other readers,

As most of you probably know, the start of the second period also means the start of a new board year. We are proud to present the new board for 2017 / 2018 in this Mol. The transition from the old board to the new was celebrated more than adequately right after the General Members assembly on the 30th of November. After the official business we had a lovely dinner and a night out in The Hague where, of course, we discussed our new functions extensively. Our priorities, amongst others, include more interactive lunch evaluations and better contact with the Alumni of De Ondergrondse. Besides this, music at the Geodrink is at the top of our wish list!

To give you a better idea of who is running De Ondergrondse now, we will all briefly introduce ourselves.

Jasper Snoeren – Chairman

I started my Applied Earth Sciences Bachelor in 2012 and since then my interest in Geo-Engineering began. Besides the enthusiasm for the study, I always love to participate in all kinds of events and meet people with different backgrounds and fascinating stories. Therefore, I am looking forward to this amazing year full of events that lies ahead of us and with that I can also say that I am more than happy to be part of the 12th board of De Ondergrondse.

Floor van Daatselaar – Secretary

After finishing the bachelor Civil Engineering at TU Delft, I decided I wanted to continue my studies in the field of Geo-Engineering. Besides being the secretary this year, me and my committee will also be responsible for providing the thrilling new editions of the Mol Magazine. I am really excited to be a board member this year and hope to see everyone at the upcoming events!

Philip Voorn – Treasurer

After four years of studying Applied Earth Sciences in Delft, I was able to make the right choice and enrol for the Geo-Engineering Master. In addition to studying, as treasurer of De Ondergrondse I will make sure that everything will run smooth financially and we can organize a lot of great activities. It's going to be amazing!

3 From the Board

Nataly Filipouskaya – Commissioner of Activities

I am an international student, so alongside the organization of the Geodrink and other awesome events I also feel very proud to represent the interests of the students from abroad. I grew up in Belarus but further used to live in several countries like Germany, Namibia and Malta. Exploring new places, learning new cultures and meeting new people are my main hobbies. And what is the best place to meet new people at TU Delft if not during the next geodrink at the geo corner? Looking forward to seeing everyone there!

Florentine Steijlen – Commissioner of Education

Last June, in the previous academic year, I became a board member of De Ondergrondse. I will remain commissioner of education till June 2018. I want to improve the lunch evaluations, which started last year, by making them more interactive. If you have questions about the curriculum or if you want to share your feedback about the courses, please let me know or ask one of the other board members!

Hopefully, you now have a better idea of who we are and what we will mean to you this coming year. We must say that we are very motivated and confident that we will make this into a wonderful year with lots of awesome Geodrink, excursions and trips.

For now, we would like to wish everyone a very Merry Christmas and a Happy New Year!





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Recent Activities

Witteveen+Bos Lunch Lecture

October 17, by Vlad

On Tuesday, the 17th of October, our main sponsor “Witteveen+Bos” offered our students a lecture on the geotechnical interpretation and application of the full-scale trial excavation at the Oosterweel project in Antwerp. The presentation raised a lot of interest, thus many students joined to see the challenges that the project brought, together with the solution to those challenges.

The Oosterweellink was designed in order to solve the mobility problems in the Antwerp region. This will improve the city and the port’s accessibility, reduce congestion on the southern part of the ring road and generally, improve the quality of life in the Antwerp region. The presenter showed us the steps that had to be undertaken in order to design the excavation.

The students were very engaged during the whole lecture, as it was very important for them to observe the criteria on which the degree of complexity of your model should be chosen. This is a skill that comes with experience and it is not readily available for starting junior engineers, so input on the subject is very appreciated. In conclusion, the lunch lecture was a great success, with a very good amount of knowledge transfer between the lecturer and the students involved, and we hope to hear more about this project in the foreseeable future.



October 13, by Florentine Inaugural Lecture Ken Gavin

In 2016, Ken Gavin was appointed as a professor at the Faculty Civil Engineering and Geosciences. At the 13th of October 2017, he gave his inaugural lecture ‘From unexpected past to predicted future’ and officially accepted his chair “Subsurface Engineering”. Prof. Ken Gavin gave examples of his research interests and presented results discovered both when he still was a PhD student at the Trinity College in Dublin during his present position in Delft. Thereafter, he reviewed the revolution of wind installations over time and discussed the ambitions for the future with regard to the Paris agreement. He showed the importance of monitoring by giving some examples of influences of climate change on infrastructure.

Ken Gavin is responsible for the elective course “Soil Structure Interaction” in quarter 4. He is an excellent and inspiring teacher, which is mirrored by the large number of students attending this course.

General Members Assembly *November 30, by Nataly*

On the 30th of November the yearly organized General Members Assembly of dispute De Ondergrondse took place. The main topics that have been discussed by the members and the board were the current status of finances, past and future events as well as plans and goals for the upcoming year. For the members of the dispute, this was the opportunity to ask their questions regarding any dispute activity as well as to make their suggestions and share ideas. Furthermore, this event served as board transfer - the 12th board of De Ondergrondse for the year 2017/2018 was presented during the assembly. The new board members used this opportunity to introduce themselves, to talk about their priorities as well as to show their motivation and ambitions for the future activities within the board. The evening was closed with discussions and drinks at the geo corner with students and Section. De Ondergrondse would like to thank everyone who showed their interest and attended the assembly as well as to wish good luck to the new board.



October 19 Geodrink



November 29, by Richard & Goitze Witteveen+Bos Business Case

On Wednesday the 29th of November Witteveen+Bos hosted a business course at their office in Amsterdam on the Oosterweelverbinding in Antwerp. Students from different technical masters were invited to come up with a plan to improve the infrastructure around Antwerp. Several geo-engineers took on this challenge.

At 9 o'clock we were welcomed at the office with coffee and tea. With some caffeine in our systems the day started with a presentation from one of the company's CEOs. After this, the first of the day's assignments was presented. We were to come up with a proposal to improve the infrastructure around Antwerp. In multidisciplinary teams of 6 people we had one hour to come up with a solution. The subsequent presentations contained many ideas, including the completion of the highway ring around Antwerp, a motor free zone in the city centre and improvement of infrastructure for bikes and public transport.

After this, it was time for the main assignment of the day. Three challenges about the Oosterweelverbinding were divided among the six groups. After briefly looking into the assignments it was time for lunch, with tasty sandwiches and the opportunity to talk to Witteveen+Bos employees. After lunch, it was finally time to tackle the main assignment. We were to come up with three solutions for our respective problems, choose the best option, and make a presentation about our choices. We had to take risk, environment, costs and time into account. During the afternoon there was time to briefly consult experts on different fields of the project.

One of the projects was about the completion of the highway ring around Antwerp by an immersed tunnel in the Schelde river. The design was to limit the disturbance to the port of Antwerp and had to be relatively cheap. Furthermore a nature reserve was included in the design, which could be used as a flood plain during times of high water. Another project consisted of a tunnel underneath the harbour, of which two ends needed to be connected. Besides this connection, traffic with different destinations had to be led in the right directions.

At the end of the afternoon, each group had to present the results they had found during the day. It was very interesting to see what different challenges came in to play for this project, and how students thought they could be solved. After this, a Witteveen+Bos engineer gave a presentation on the actual solutions used for the Oosterweelverbinding. Witteveen+Bos had not only come up with clever solutions to the challenges that came with all this new infrastructure, but had also managed to save €400 million on the original plans.

Finally, a jury of senior Witteveen+Bos employees chose the best design of the day. The group that had come up with this design were awarded with some Belgian beers. After this it was time for drinks and dinner. Witteveen+Bos employees switched seats after each course of the meal, so there was the opportunity to talk to several people with different project backgrounds.

The entire day was well organised and very interesting. We would recommend Dutch geo-engineers to sign up for the next opportunity, which will take place in about six months.



Sentijn

Growth starts with great ambition



> INNOVATIEVE BANEN VOOR INGENIEURS

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Sentijn is gespecialiseerd binnen het vakgebied van ingenieurs. Centraal in onze dienstverlening staat het focussen op de wensen en ambitie van ingenieurs, in combinatie met het inspelen op de vraag naar gekwalificeerde ingenieurs vanuit onze opdrachtgevers. Ben jij als ingenieur op zoek naar een mooie uitdaging binnen de techniek, neem dan vrijblijvend contact met ons op via onderstaande gegevens.

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Master's

At the moment of writing I graduated less than 48 hours ago. Now that the alcohol percentage in my blood dropped back to "normal", considering student standards, I will tell you something about my research and the process of writing a thesis. I will also share some tips and tricks that helped me to get through these months. But first, let me introduce myself. My name is Erik Beutick, finished my bachelor's in Civil Engineering in Delft and started the master Geo-Engineering a little over 2 years ago. During the master, I was part of the rise of the GeoDudes, joined the SWA in Maastricht and last summer's KBR in Italy.

The search

A master's thesis starts with the search for a topic. And here is the first tip; make sure you have an idea about what topic you like and whether you prefer to write your thesis in a company or in uni. Some companies have posters with topics displayed in the geo-corner but there is a lot more available with the professors. Also consider what type of research you prefer. Is it numerical modelling, physical modeling or a combination of both?

I did an internship at a contractor and preferred to write my thesis with an engineering firm to experience the difference between the two. I sent around some applications and Arup offered me a position. There were no requirements on my topic by Arup, therefore I made some appointments with the professors at geo to talk about my interests and what matching topics were available. Professor Gavin introduced me to time-dependent bearing capacity of piles in sand and told me that a test program was coming up at Port of Rotterdam. I thought the topic to be very appealing and I liked the idea of generating my own data instead of working with a case history.

The struggle

The thesis starts with a literature review to see what has been done and where there are opportunities for you to contribute. Write a proposal for the green light meeting where you clearly state your research question and sub-questions. Don't wait too long with your green light meeting, your thesis will take shape along the way. I think there are very little students that look back when they are finished and did exactly what they planned to do at the start of their thesis. There is nothing wrong with adjusting your plan along the way but communicate with your committee and make sure that all parties involved have the same expectation.

I also had to adjust. Soon after the green light meeting it became clear that the test program in the Port of Rotterdam was not going to start within the timespan of my thesis. However, there was still the opportunity to work on a test program. The NVAF (Dutch Association of Piling Contractors) initiated a scaled test program where 8 scaled piles were going to be tested. The NVAF was interested in what influence the shape of the pile tip had on the tip bearing capacity of screw displacement piles. In addition, 4 closed-ended steel piles, 3 meters of length and with a diameter of 0.15 meter, were installed for my research on time-dependent bearing capacity. The virgin capacity of a pile was assessed 2, 16, 31 and 70 days after installation. The piles were tested in compression and strain sensor equipped fiber optics were glued to the piles to determine the resistance along the shaft and at the pile tip. Special about this test was that the piles were tested in a man-made sand deposit. The test pit was located near the head office of Gebr. Van 't Hek in De Beemster where all equipment was available. See the article by IJnsen & Admiraal in *Civiele Techniek* nr. 7 – 2017 (Dutch only) for more information on the screw displacement piles and check out my report for the research on time-dependent bearing capacity.

Thesis

By Eric Beutick

During my research I worked at the Arup office in Amsterdam for most of the time. I tried to stick to office hours and not to work during the weekends, at least not for the first few months. A thesis is an individual project and you will get fed up with the research every now and then. At Arup there were always nice colleagues available that helped me relief stress during a game of ping pong. What also helped when I got stuck was a cup of coffee and a chat about my struggles and share ideas with anyone who was willing to listen. I experienced that people with the least knowledge on my topic sometimes gave the most valuable comments. The geo-drinks provided perfect opportunities to discuss progress with future geo-engineers. So don't miss these opportunities. Although, thinking about it, the day after a geo-drink was often not the

most productive day.

During the master's thesis there is time to learn new things or expand your knowledge. Don't be afraid to use a program or language you never used before. LATEX, Python, Matlab, D-series, Plaxis, Fortran, etc. go for it! During your working career there will be less time available to learn. It is also provides a nice distraction from the research itself.

Test pit under construction. Sand was applied and densified in layers to reach cone resistances between 15 and 20 MPa at pile tip level.



The accomplishment

The weeks before the green light meeting was the toughest period for me. I had to catch up some writing and still hadn't interpreted all the data. There's another tip; keep writing throughout the process. I think it is better to leave parts out than to forget stuff. Generally, most time goes to the middle section of a report but bear in mind that the start and end (abstract, introduction, conclusions and recommendations) are the parts that are read most often.

After handing in the final report it was time for the final presentation. I rehearsed my presentation for some fellow GeoDudes and for the infra department of Arup before presenting it in Delft. The rehearsals and accompanied feedback helped improve the final presentation.

At the final moment I was pretty nervous. Recent graduates told me there was no need to be nervous but that is more easily said than done and still it is the same I will tell you. Try to keep it simple and you'll be fine. I hope this article helped the ones who are about to finish, just started or will start their thesis research soon. The best of luck!

With this article I complete my life as a Geo-Engineering student. The learning curve was steep but I enjoyed it very much. **I would like to thank all that contributed to the joy I had and I hope to stay in touch. |**

Pile installation





FUGRO

Great Western

Great Western Route Modernisation

The Great Western route modernisation is an extensive programme undertaken by Network Rail to electrify one of Britain's oldest and busiest railways, providing greener, more reliable journeys. The focus of the programme is the Great Western main line (GWML), built more than 150 years ago.

For an investment of this scale, robust and timely rail asset data is essential for effective decision making but with pressure for the survey to be completed in 12 months, traditional survey techniques were inadequate. Moreover, from a safety viewpoint, Network Rail wanted to minimise the work on or near the track and eliminate any disruption or loss of track availability to passenger and freight traffic. To mitigate the time and safety issues, Fugro's train-mounted RILA survey systems provided the solution. Network Rail contracted Fugro to survey the primary routes in Western, Wales and Wessex regions, approximately 2,000 miles of rail track, using its RILA Track and RILA 360 systems.

The route requirements included the modernisation programme, the electrification scheme and the introduction of new high-speed electric trains for which Network Rail required a combination of topographical survey and 6ft and structure clearance analysis. RILA data, and some cleverly developed, complex algorithms, provided the gauging data for structures along the GWML and other alternative routes including relief lines, various loops and sidings.

Fugro's innovative RILA systems

Traditionally track measurements are undertaken by surveyors who work on and near the track and whilst doing so are exposed to the dangers of live railways. Conventional surveys are often restricted to night time working in short possession periods. Fugro's innovative suite of train-borne RILA systems is able to measure the track and rail corridor in a fast and efficient manner, designed to keep trains moving safely, without interruption to services whilst keeping survey personnel away from the track.

RILA Track

The RILA Track system uses GPS, IMU (inertial navigation) and laser vision technologies. All equipment is installed in a transportable device which can be mounted to an automated coupler of a passenger train or to a set of buffers within just two minutes. Data acquisition is at line speed and, when installed on a regular passenger train, there is no need for train paths, limiting the disruption to train services.

The system is currently cleared to operate at 100 mph and at this speed will yield profiles at 10 cm intervals with an absolute accuracy of ± 10 mm (plan) and ± 15 mm (height) without the need for ground control. As the RILA Track system passes over the track, its laser vision system projects a laser beam over each rail with the integrated camera capturing high resolution images of the rail profile and the coordinates of 1,400 laser points per railhead are calculated. The laser image of the rail head and rail foot provides high accuracy profiles and measurements (relative accuracy < 0.3 mm) that can be used to determine rail head and running edge wear as well as wear of S&C components.

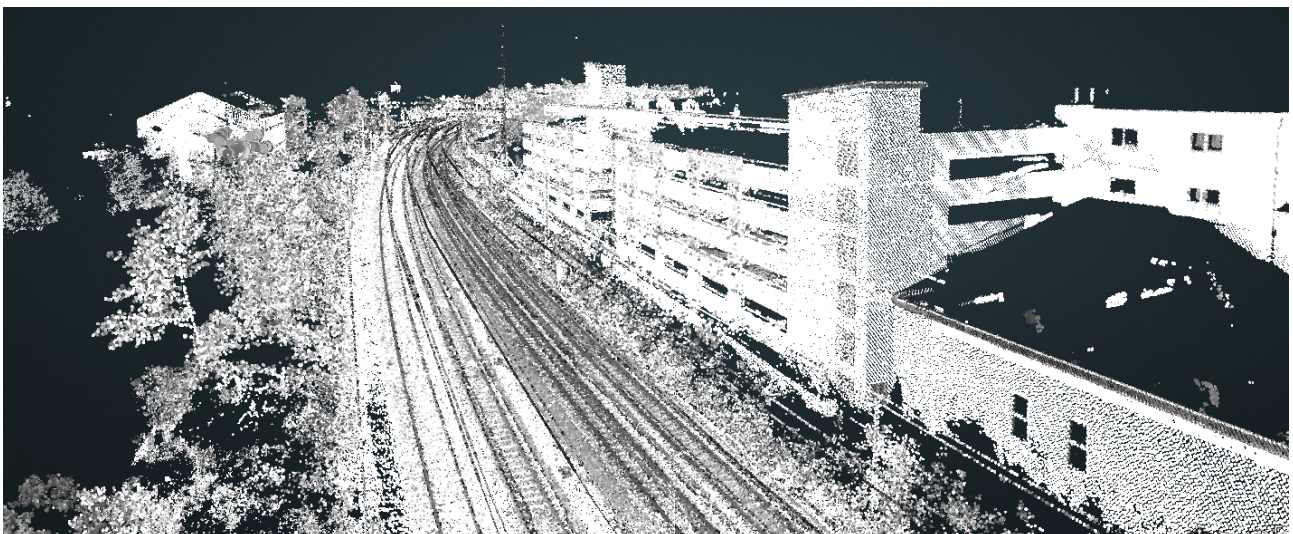
The RILA Track system also incorporates an integrated video that can be georeferenced using the system's survey data and used for desktop-based analysis and validation.

RILA 360

While the RILA Track system focusses on the track, the RILA 360 system incorporates twin 360° laser scanners and a panoramic imaging system to supply ultra-high density LiDAR point cloud data of the entire route. Each laser scanner rotates at 200 Hz recording one million points per second. The RILA 360 system can be mounted to any buffered service train scanning the complete rail corridor, including track assets, structures, earthworks and vegetation. As with RILA Track, GPS, Active GPS reference network and IMU data are used to compute the absolute position of the point cloud.

Combining RILA systems

The RILA systems work independently but they can also complement each other. The great advantage of deploying RILA Track and RILA 360 simultaneously is that four runs are undertaken with both systems, which supports the collection of high density, RILA 360 point clouds. Through an iterative process and cross-referring adjacent tracks from each track's own perspective, a homogenous point cloud and adjusted RILA track measurements are supplied to Network Rail Band 1A specifications. The result is an accurate, absolute XYZ model of all the objects in and around the track (including OLE componentry) and even higher relative accuracy of the objects, in respect of the track.



From Data to Information

The entire survey was completed progressively on a phased approach throughout 2016. Demonstrating impressive acquisition speed, the entire section from London Paddington to Bristol was completed in only 6 shifts, immeasurably faster than conventional surveying with no requirement for track possession and no disruption to service.

One of the key requirements of the project was to satisfy Network Rail's need for passing clearances. These '6ft clearances' were calculated at 5-metre intervals from the measured track alignments providing Network Rail's project team with all the track distances in Clear Route software format. This allows them to quickly analyse if the new rolling stock will cause any infringements (early-warning data) and ensure that design parameters are adhered to.

Structure gauging files (SCO), which calculate the distances from structures (i.e. over and under bridges and lineside furniture) to the tracks and their positions, are generated from the point cloud to analyse if all assets comply with the strict clearance profile. This is particularly important near platforms to check the gap between the train and platform for boarding (platform gauging or SCP files) and technical design (can trains pass this platform?).



Uniquely offering strategic efficiencies

The use of Fugro's innovative RILA systems has given Network Rail access to a wide variety of asset management and track position data providing value for money while reducing the need for traditional surveys in open line working or track possessions. "Our team has found the RILA and RILA 360 technologies to be safer, faster, more accurate and less expensive than any other method of acquiring datasets for sections of track longer than a mile," commented Chris Flynn, IEP Project Manager at Network Rail.

RILA's mantra is to 'collect once and use many times' and this was convincingly demonstrated on the section between Didcot Parkway and London Paddington, where the data have been used not only for the previously detailed Great Western projects but also for High Output Track Renewals and Crossrail.



For more information:

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Project Point Pedro

Geo-Engineering student Tijmen Blom spent the first eight weeks of this semester in Sri Lanka, as part of a multidisciplinary project team - an elective course in our Master. He shares his experiences with us.

In the first quarter of this study year, I went to Sri Lanka to take part in a multidisciplinary project together with two construction management engineering students and two hydraulic engineering students. For eight weeks, we lived and worked in Colombo, the capital. During this time, we designed a harbor in Point Pedro, which is supposed to become the second largest harbor of Sri Lanka.

After a long preparation, it was finally time to fly to Sri Lanka on the second of September. We arrived in Colombo on Sunday the third of September and had our first day of work the next day. During our first meeting, Mr. Channa Fernando, our mentor, told us that they already had made a design and asked if we could just fill in the blanks in the feasibility study. However, as this would not be sufficient for

a report for the university, we decided not to do this. After some discussion with Mr. Fernando, we agreed upon doing a full feasibility study for the location which was currently selected. We also agreed on working at the Ministry of Fisheries and Aquatic Resources for one day a week, plus three days at the office of EML consultants. On Fridays we would work at home.

We split the project up into three different parts: the analysis phase, the conceptual design phase and the master plan phase. We started with the analysis phase, in which we did most of our research for the project. Amongst others, we analyzed the site conditions and the way the stakeholders were involved in the project. After we had made a general overview of the site and the project, we continued with the conceptual

designs. This resulted in a couple of days of heavy discussions and brainstorming, after which we came up with three alternatives to the design which was currently proposed by the Sri Lankan Ministry of Fishery.

A couple of days later, we had a progress meeting with Mr. Fernando. We showed our work up until that point, including the conceptual designs. At this point, he was surprised by the designs we had created. If we could combine the good aspects of the conceptual designs into a masterplan, aspects could be included in the final design by the Ministry for the harbor. This was a real morale boost as up to that point we had the feeling that no matter what we did, the design which was currently in place was going to be constructed.

Spurred on by this little success, we continued with the master plan phase. During this phase, we created the design which you can see in the Figure. For this design we also created an implementation plan. After the hard work we still had to present our findings three times, at the Ministry of Fishery, EML consultants and the Dutch Embassy. After the presentation at the Ministry of Fishery they told us they expected to use aspects of our design in their design, which was quite a lot more compared to what we expected after the first week. Which gave, at least to me, a real sense of accomplishment.



After the project was done it was time to do the same as I have been doing in the weekends, explore Sri Lanka. Overall Sri Lanka is a very beautiful, extraordinary country with a lot of different things to offer on a relatively small area of land!





The Geodudes get back on winning track!

After the nice performances during the first two matches, the Geodudes tried to continue this act during the following games. The next three games, the Geodudes showed good teamwork and converted their matches in wins. However, the opponents were not that strong. The first 'big' match for the Geodudes was scheduled on October 23th against the famous 'Café Tweek'. The Geodudes had some difficulties to play their famous pressing game. The opponent played a clever game and the Geodudes lacked some luck by hitting the woodwork a couple of times, which resulted in the first loss of the season: 2-1. Midfielder Veerkamp claimed that the Geodudes deserved more than this: 'Most parts of the game were good but it doesn't feel like it at the moment. We need to continue like this and don't change our tactical game', the blond Dutchman reflected.

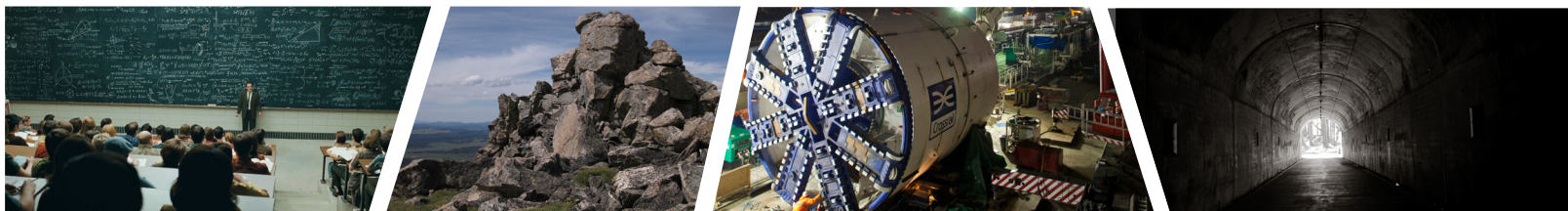
The following four weeks, the Geodudes didn't have any game to play. Some players decided to train individually to stay in good shape. During this transfer period the strong midfielder Rik-Jan Wildeboer decided to make a transfer to FC Groningen. We all have to thank Rik-Jan for his skills and passion he showed during the games he played.

After the break, another tough game was scheduled against Ampel 1. Last year, they showed a good defensive game, which resulted in little victories for the Geodudes. The Geodudes knew they needed to be cautious for the counterattacks of Ampel 1. However, one moment of a lack in concentration resulted in a goal of Ampel 1. The Geo Dudes needed to re-group and they did as only a real Geodude would do. The Geodudes converted the losing position in a 4-1 victory! A small crisis was turned away and the Geodudes gained some confidence for the following games. The next game, the Geodudes gained more confidence. The game was played against 'low flyer' Partizan Ricardo. The Geodudes destroyed them with 13-1! During this game, Munta den Boorder and Kevin Brh made their debut.

As a captain, I am aware that a season being champion is always difficult (Feyenoord red.) Everyone has high expectations and it is up to us to confirm those expectations. I am confident we can do this and I am happy with the current performances. #MakeGeoGreatAgain

Sjors Dicker
Captain Geodudes

Upcoming Activities



December	21	Geodrink++
January	11	New Years Dinner
January	13	Open Day at Rotterdamse Baan
February	15	Geodrink

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Colophon

