Rebuilding Dutch Megalith burial tombs

The sight of Dutch Megalith burial tombs or Dolmen in the north eastern part of Holland is just fascinating. But the big question is: How did our Neolithic ancestors moved these ten thousand kilo stones and how did they raise them on top of each other?

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Numerous archaeological experiments have been carried out to answer this question, especially around Stonehenge. Most experiments have tried to show the Neolithics could have built these megalithic monuments. Because of this focus we are left with different theories which are all very plausible but for us the most important question was: Which of these theories is the most efficient and therefore the most likely to have been used during the Neolithic era.

On the weekend of 13 and 14 September 2008 a group of Archeon co-workers and enthusiasts put these theories to the test in an attempt to rebuild a Dolmen with the most efficient theory possible. An abstract of our findings will be discussed here.

The experiment

In this experiment the aim was to recreate a Dolmen such as is found in the North Eastern part of Holland called Drenthe. In this small area 52 Dolmen have been found the heaviest stone weighing over 23.000 kg. These dolmens all consist of two or three upstanding stones and one capstone (As seen on **picture A**).

To rebuild a Dolmen there are three major questions to be answered;

1. How did they move the stones from the place where they found them to the building site?
2. How did they get the stones to the required height?
3. How did they place the stones with such accurate precision?

Archaeologists have come up with multiple solutions for these questions. Again the major goal of this experience was to see which of these solutions was the most efficient.

Moving the stones

The stones that the Neolithic's used were remains of the last ice-age. Plenty of these rocks are found in Drenthe so the distance to the building site would never have been far. During the experiment we tried different approaches to moving the stones. The most common theory is using small wooden trunks rolling under the stone like a set of wheels. We tried this but it din't work becouse of the soft ground. The trunks would just sink in the ground. After that we placed a rail made from 4 meter long split wooden trunks. We tried to use the rolling logs on the rails, but when we started pulling both the stone and the logs moved together. In the end we found that the easiest way of moving the stone was the use of just rails. The use of the rails solves the problem of the soft ground but the pulling force to overcome the initial friction needed to be slightly bigger. We found that the initial friction was easily overcome with an average of 10 people and when the rock was moving it would slide with great ease. (see **picture B**).

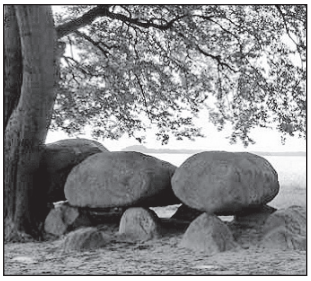
The major problem we encountered was not pulling the weight of the stones but attaching the rope around the stones. A single rope slips off to easily so we started using a net like construction depicted in **picture B**. When the net was properly constructed it was easy to use for the different stones and because of the larger contact area with the stone the net made pulling and directing the stone a lot easier.

Lifting the stones

The most common theory to raise capstones to the required height is the use of a slope. The already placed stones are submerged in small man made sand hill. The slope of the hill is used to pull the capstone over the standing stones. The major problem with this theory is the angle of the slope. A slope with a large angle is easier to build because it uses much less sand but the steeper the slope the more difficult it becomes to pull the stone up the hill. A slope with a small angle makes it a lot easier to pull the stone over but requires loads of sand and manpower to create.

Further more there are two more problems that need consideration. A newly built sand slope is not strong enough to support the weight of the stone. Therefore you have to reinforce the slope with wooden poles or you have to wait until the ground has been compacted. This takes time and even in the neolitic period, time is money and food. Secondly there is the problem of getting the stone to move over the slope. Where do you put the men that pull the stone? How many people do you need to pull the stone? Considering that moving the stone horizontally requires a lot of manpower pulling the stone up over a slope makes it even harder.

So we think raising the stones asked for a different approached. We think they knew how to use levers and we know



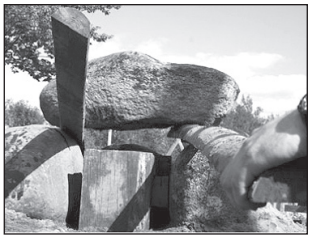
■ **Picture A** Dolmen at Bronneger (source: wikipedia)

■ **Picture B** Pulling the stone over the rails with a net robe construction

■ **Picture C** Lifting the stone with levers to put wooden logs under it

■ **Picture D** Greasing the rails before final placement

■ **Picture E** Pulling the capstone over the standing stones with the use of levers and rope



■ **Picture F** Capstone hovering over the standing stones just before placement

■ **Picture G** Dolmen building team

they had a lot wood available. So instead of using a slope we tried to raise the stone by putting wooden logs underneath by using levers. Tests showed that it only took one man with a 3 meter lever to lift the 1200 kg stone on one side. Because of safety and practical reasons we decided to use 3 persons on one lever and use two levers on one side of the stone. Our plan was to raise the stone step by step by putting pieces of wood under the capstone untill it was level with the standing stones. To make this work we first lifted one side of the stone. When the stone was tilted, we put a piece of wood underneath the stone. Then we lifted the other side and put another piece of wood under that side so that the stone was level and secure. By doing this several times, gaining 9 cm each time, the stone slowly but steadily rose up. To make sure the pile of wood was stable and strong enough we used a pyramid like structure (as seen on **picture C**). Because of the repetition of the work groups of people developed with one task. We had for example a lever team, a wood placing team, and a reinforcement team. These teams gained experience very quickly and so the overall work was able to gain speed the higher we got. To our amazement it only took one hour to lift the capstone the 75 cm needed to be level with the standing stones.

Placing the stone

Our first challenge of placing the stone was to move the stone from the top of the pyramid to the capstone's final place on top of the standing stones. To make an easy crossway between the pyramid and the standing stones we used the logs of the rails for the final stage of the pyramid (as seen on **picture D**). These logs stretched from the top of the pyramid over the standing stones and we supported the stretch with wooden logs. When the construction was in place pulling the capstone from the pyramid on to the top of the standing stones was easy (**picture E**). We experienced that the combination of levers and the slow stripping of wood construction gave us great control over the stone. This made it possible to place the capstone with great accuracy. (**picture F**). With the final placement of the capstone the Dolmen was completed. Placing the stone took another hour so the amazingly fast time and the success of finishing the Dolmen lead to great excitement.

Discussion and conclusion

The recreation of the Dolmen taught us a lot about how the Neolithics could have built their Dolmen and the experience that we had gave us some great new insides.

We were amazed with the ease of moving the megaliths over a rail of wooden trunks. This was fast and easy once the initial stone/wood friction was overcome. The construction of the net made moving the stone a lot easier but the quickness of the movement of the stone was held back by the length, about 4 meters, of the wooden trunks. This led us to believe that the Neolitics used sleds for moving the stones. The use of sleds for moving heavy loads is still used on the tundra of Siberia so we are excited about trying this in next year's experiment.

The use of simple wooden levers went with ease and great accuracy. The stones we used where the size of smaller Dolmen found in the Netherlands and weighted about 1000 kg – 1500 kg. This made pulling and lifting of the stones with levers quite easy. The smaller stones gave us the advantage of trying things out and gaining experience without too much danger and effort. With this experience we are convinced that we can have the same result with larger stones as we had with these smaller stones, only with the use of bigger levers and more man power. So we are looking forward to building a Dolmen with larger stones next year.

Finally we are very pleased with the result of the pyramid lifting technique. This went faster than anybody could have expected. Especially the fact that teams of people with one task gained experience quickly and made the process a lot faster. Next year we want to try out more with the specialist groups like a lever team, wood placing team, reinforcement team, pulling team all coordinated by one construction master.

In the end it took us about two hours to get the 1200 kg stone from ground level on to the top of the Dolmen.

Now we have learned and developed our skills we think we can do it in one hour. Further calculations made us estimate that, if all stones are already on site, building a 12 stone Dolmen out of 1000 - 1500 kg stones would take about 7 days with a team of 10 experienced men.

After this first experiment we are thrilled with the results and looking forward to use our experience next year in the recreation of a larger Dolmen. We hope that this sharing our experiences we can contribute to the discussion on how Dolmens were built around Europe. We are very curious about other theories and thoughts on improvements of our methods so we can combine our knowledge in future experiments.

Summary

Reconstitution d'une tombe à incinération mégalithique hollandaise.

Avec le temps, les expérimentateurs ont formulé un certain nombre d'hypothèses plausibles sur les modes de construction des tombes mégalithiques au Néolithique. La question est de savoir quelle méthode s'approche le plus de celle qui devait être utilisée. Pendant cette expérience de reconstitution d'un dolmen basée sur la découverte de Drenthe aux Pays-Bas, les expérimentateurs ont testé plusieurs méthodes pour déplacer un bloc de pierre. Ils concluent que la manière la plus simple repose sur l'utilisation de simples rails de bois. La meilleur méthode pour soulever la pierre qui recouvrira le dolmen est le recours à des leviers de bois.

Zum Nachbau von Megalithgräbern in den Niederlanden

Im Laufe der Zeit haben Experimentalarchäologen eine Reihe von möglichen Theorien zur Errichtung von Megalithgräbern durch die Neolithiker entwickelt. Die Frage ist dabei, welche dieser Methoden die effizienteste und die vermutlich genutzte ist. Bei einem Experiment zum Nachbau eines nach Befunden aus der niederländischen Provinz Drenthe stammenden Dolmens wurden mehrere Methoden ausprobiert, mit denen Findlinge zu bewegen sind. Die Ergebnisse zeigten, dass die einfachste Methode des Steintransports mit Hilfe von einfachen hölzernen Schienen zu bewerkstelligen ist. Die erfolgreichste Methode zum Aufbringen eines Decksteines wurde mit hölzernen Hebeln durchgeführt.