

Balance Puzzles

You either love them or curse them

**Paper for the souvenir book
by Rik van Grol**

**For G4G13
April 11 - 15, 2018**



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A well-known balance puzzle is the Columbus Egg. The object is to balance the egg on its tip. Impossible so it seems! By using other senses than just vision, such as hearing and feeling, and by logical thinking, some patience and above all perseverance the solution can be found. Careful manipulation of the egg centralizes the weight of the egg and then it can be balanced on its tip. Many people lack some of the above mentioned qualities and will never solve these puzzles; consequently they dislike them or even curse them. Some even say that they are not puzzles. If they would experience solving them they would realize that these are indeed puzzles and they would love them.

Introduction

What do I mean with a balance puzzle? When you google for the term "balance puzzle" the search results do not lead you towards the puzzles I mean. The balance puzzle, or weighing puzzle, google provides is a logic puzzle about balancing items, often coins. Other balance puzzles will also appear. To find the puzzles I mean you should google for the term "*Columbus Egg puzzle*". Many of the balance puzzles this paper is about are egg-like objects, but not all of them.

So what is a balance puzzle? Best is to take the egg balance puzzle as an example. The object of the egg balance puzzle is to put the egg on its tip. With a regular egg this will result in the egg tipping over (not always – see the tale about Columbus), but with the egg balance puzzle there is a way to manipulate the egg in such a way that it will indeed stand on its tip.

A famous example is the *Columbus Egg* presented at the World Fair in Chicago in 1893. This metallic souvenir egg contains a ball that can be manoeuvred in such a way that it falls down a tube and ends up in the tip of the egg on which it can then be stood upright.

So, what are typical properties of a balance puzzle?

- They are single piece puzzles in that they are not meant to be taken apart.
- The puzzle needs to be manipulated in such a way that something internally is changed in order for the object to be balanced.
- Most balance puzzle do not have handles or levers.
- They can only be manipulated in a 3D-space: e.g. lifted, tilted, rotated, spinned.
- Most balance puzzles provide no clues as to whether or not you are heading in the right direction to solve it.
- With these puzzles you are, as it were, "left in the dark".

These properties, that most balance puzzles have, are exactly the properties that make you either love these puzzles or curse them. To solve a balance puzzle you need to use other senses than with most mechanical puzzles. Instead of depending on visual clues you now depend on sound, feeling and your creative ability to crawl into the mind of the designer. Many people, and also puzzlers, do not like to be left in the dark. Balance puzzles can be very frustrating, and unlike secret opening boxes (that share similar properties) they generally lack a satisfying AHA feeling. Personally I am in-between love and hate. I hate balance puzzles until I have solved them, then I love them...

In this paper I will start with some anecdotal history about egg balance puzzles. This will be followed by an overview of balance puzzles. Then I will talk about the different types of mechanisms used in balance puzzles, and how to solve them.

Afterwards you can decide for yourself whether to like or to curse them...

Anecdotal history

The oldest egg balance puzzle I know of is the *Columbus Egg*, see Figure 1. I am sure there must have been earlier puzzles, but not produced in the quantity as this one. I also do not have any record of other such puzzles from an earlier age. If a reader does, I would be very much interested.

The *Columbus Egg* was presented at the World Fair in Chicago in 1893 as a souvenir. Wikipedia says the following about this event [1]:

The World's Columbian Exposition (the official shortened name for the World's Fair: Columbian Exposition also known as the Chicago World's Fair and Chicago Columbian Exposition) was a world's fair held in Chicago in 1893 to celebrate the 400th anniversary of Christopher Columbus's arrival in the New World in 1492.

Wikipedia also mentions an "Egg of Columbus" in relation to the World Fair, but this is not our puzzle egg. The mentioned egg is a metal egg that spun inside an electric field. Quite a novelty at that time... I have found no record of our puzzle egg being mentioned in relation to the World Fair, but it must be strongly related to the same celebration as the puzzle depicts Columbus and the period 1492-1892. In *The Book of Ingenious & Diabolical Puzzles* [2] Jerry Slocum mentions the Egg of Columbus as made for the Columbian Exposition. Professor Hoffmann in *Puzzles Old and New* [3] also mentions a *New Egg of Columbus*, but this is not our egg.

So, there are quite a few Columbus Eggs... What is it about Columbus and eggs anyway? This has to do with a tale, and the clue of the tale is related to solving these puzzles. It is a tale from (according to Wikipedia) the historian Girolamo Benzoni, who wrote [4]:

Columbus being at a party with many noble Spaniards, where, as was customary, the subject of conversation was the Indies: one of them undertook to say: "Mr. Christopher, even if you had not found the Indies, we should not have been devoid of a man who would have attempted the same that you did, here in our own country of Spain, as it is full of great men clever in cosmography and literature." Columbus said nothing in answer to these words, but having desired an egg to be brought to him, he placed it on the table saying: "Gentlemen, I will lay a wager with any of you, that you will not make this egg stand up as I will, naked and without anything at all." They all tried, and no one succeeded in making it stand up. When the egg came round to the hands of Columbus, by beating it down on the table he fixed it, having thus crushed a little of one end; wherefore all remained confused, understanding what he would have said: that after the deed is done, everybody knows how to do it; that they ought first to have sought for the Indies, and not laugh at him who had sought for it first, while they for some time had been laughing, and wondered at it as an impossibility.

This out-of-the-box-thinking is exactly what is needed for solving many puzzles, especially these puzzle eggs. Quite often, maybe even always, egg balance puzzles are categorized under dexterity puzzles. And, yes, they certainly need some dexterity for solving, but by applying logic, deduction, creative thinking it can become much more a puzzle that can be solved at will.

Overview of balance puzzles

An small overview of some balance puzzles is available on the internet, on Rob's Puzzle pages [5]. It starts off with the *1893 Columbus Egg puzzle* but also shows several of the others presented below. Partly due to a link on his pages I was led to a number of patents on egg balance puzzles. The U.S. Patent Office devotes an entire sub-class to "Balancing Ovoids" (ccl/273/154). Most of the patents are from the time around the *World's Columbian Exposition* in 1893. Rob's pages also demonstrated that there are several variants of the *1893 Columbus Egg puzzle* – some with an inscription: "World's Fair Souvenir". My copy of *Columbus Egg* does not show these words.

No.	Name	Date	Balance object	Solution type	Puzzle / trick	Description
1	<i>Columbus Egg Puzzle</i>	1893	ball	logic & path	puzzle	Metal egg shaped balance puzzle. Internally there is a ramp that will let the ball fall into a tube towards the tip. Made by P.M. Baumgardner & Co, USA. Puzzle in my possession.
2	<i>Fall Guy</i>	1951	sand	trick	trick	This is a small trick in the shape of a man. This is more a magic trick than a puzzle. After holding it upside-down for about 20 seconds you can turn it around and balance it on its feet. Then after about 15 seconds it will fall over. From <i>Four Guys Products Inc.</i> , New York, USA. Puzzle from the Lilly Library, Bloomington, IN, USA.
3	<i>Magic Egg Puzzle</i>	?	ball	logic & path	puzzle	Plastic egg-shaped balance puzzle. Internally there is a ramp that will lead the ball to a central resting position, which will allow you to balance the egg. Patent US 1,763,814. Puzzle from the Lilly Library, Bloomington, IN, USA.
4	<i>Magic Egg</i>	?	sand	trick	trick	A.k.a. L'Oeuf Enchanté, Trick-ei, "Ei des Columbus". This is an egg-shaped balance puzzle from Pussy, Germany. This is more a magic trick than a puzzle. After holding it tip-side-up for 20-25 seconds you can turn it around and balance it on its tip. Art-Nr. 80 2100. Then after about 10 seconds it will fall over. Puzzle in my possession.
5	<i>The Trick</i>	?	sand	trick	trick	This is a trick in the shape of a doll. This is more a magic trick than a puzzle. After holding it upside-down for a while you can turn it over and balance it, head in the air. Then after a while it will fall over. From TOBAR Norfolk UK. Puzzle from James Dalgety.
6	No name	?	ball	logic & path	puzzle	Yellow-red plastic egg-shaped balance puzzle. Internally there is a trench that will lead the ball to a central resting position which will allow you to balance the egg. Origin unknown. Puzzle in my possession.
7	<i>The X super puzzle</i>	1984	n.a.	twisty	puzzle	A.k.a. Columbus puzzle(?). This is an egg shaped balance puzzle, but unlike others it has two moving parts. The bottom half of the egg can rotate in relation to the top, and it has a sliding button with three positions. There is also a small window, behind which there are five disks visible that each can take ten positions. One of the ten positions shows red through the window. Sequences of rotations and different positions of the button are needed to get all five disks to show their red position. Then a weight is unlocked, which will allow you to balance the egg on its tip. Origin: Japan. Patented by Morichika Hatakeyama and Koichi Minami. Patent US 4,489,944. Puzzle from the Lilly Library, Bloomington, IN, USA.
8	<i>L'UOVO DI COLOMBO</i>	1990's	ball	trick	puzzle	Plastic egg-shaped balance puzzle. Internally there is a tube. No ramp or anything else to help. Object is to get the ball into the tube, which requires dexterity. Patented by Sileno Lavorini, Pat no. 0336/676303. Made in Italy. Puzzle in my possession.
9	<i>Tower of Pisa</i>	2000	sand	logic	puzzle	This wooden tower of Pisa is a slanted tube. Internally it has cavities with sand. By moving the sand around, balance can be reached. The puzzle also contains a ball as decoy. Exchange puzzle from Tatjana Matveeva (Russia) at IPP 20, in 2000, in LA, USA. Puzzle in my possession.
10	<i>Dice</i>	2002	ball	logic & path	puzzle	This is a die that is to be stood upright on a flattened corner. Internally there is a ball and a central stem on which the ball can be positioned to balance the dice. Dexterity is expected, but with the right movement you always succeed. Exchange puzzle from Jacques Zeimet (France) at IPP 22, in 2002, in Antwerp, Belgium. Puzzle in my possession.
11	<i>Clock</i>	2008	ball	logic	puzzle	This is a disc that looks like a clock that is to be stood upright. Internally there is a ball, and several moving objects (the latter are fixed to their position). The ball must be moved between the objects to a location in order to balance the puzzle. Exchange puzzle from Jacques Zeimet (France) at IPP 28, in 2008, in Prague, Czech Republic. Puzzle in my possession.
12	<i>Rik's Egg Balance 2010</i>	2010	two balls	logic & path	puzzle	2D-egg-shaped balance puzzle. This is a flattened egg made of wood. Internally there is a ramp by which the two balls need to be transported to the tip, one at a time. Exchange puzzle from Rik van Grol (The Netherlands) at IPP 30, in 2010, in Osaka, Japan. Puzzle in my possession.
13	<i>Rik's Egg Balance 2011</i>	2011	ball	logic & path	puzzle	2D-egg-shaped balance puzzle. This is a flattened egg made of wood. Internally it is mostly empty. The provided stand needs to be used to release the ball such that the ball drops to the tip. Solution is symbolically depicted on the outside of the puzzle. Exchange puzzle from Rik van Grol (The Netherlands) at IPP 31, in 2011, in Berlin, Germany. Puzzle in my possession.
14	<i>Rik's Egg Balance 2013</i>	2013	sand	logic & path	puzzle	2D-egg shaped balance puzzle. This is a flattened egg made of wood. Internally there are several chambers, partially filled with sand. The sand must be manipulated such that it is transported to the tip. Solution is symbolically depicted on the outside of the puzzle. Exchange puzzle from Rik van Grol (The Netherlands) at IPP 33, in 2013, in Narita, Japan. Puzzle in my possession.
15	<i>Ze Balancing Egg</i>	2015	ball	logic & dexterity	puzzle	Wooden egg-shaped balance puzzle. Traditional balance puzzle, but with a very subtle ramp. Exchange puzzle from Stephen Chin (Australia) at IPP 35, in 2015, in Ottawa, Canada. Puzzle in my possession.



1. Columbus Egg Puzzle



2. Fall Guy



3. Magic Egg Puzzle



4. Magic Egg



5. The Trick



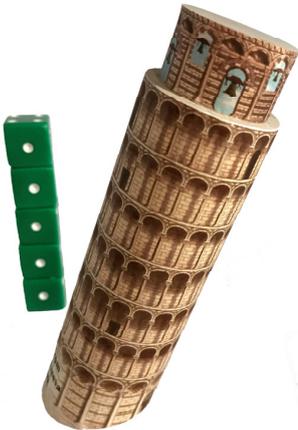
6. (no name available)



7. The X super puzzle



8. L'UOVO DI COLOMBO



9. Tower of Pisa



10. Dice



11. Clock



12. Rik's Egg Balance 2010



13. Rik's Egg Balance 2010



14. Rik's Egg Balance 2010



15. Ze Balancing Egg

Mechanisms of balance puzzles

The mechanisms of balance puzzles and their solution type are closely related. In the table above different solution types are listed. The solution types relate directly to the method used to transfer the moving weight to a position where balance can be achieved. This is generally done by centralizing the weight. The solution types listed are:

- **Path** — With path I mean that there is a distinct place or position to start (to position the weight) and then there is a specific path or movement to make, after which the weight is centralized and the egg can be balanced.
- **Trick** — The eggs classified as trick are not puzzles that you can solve. They are more attributes of a magician. A magician will make you believe the “puzzle” can be solved (the egg can be stood upright), but this is an illusion. The object seems to balance indefinitely, but in reality it does so for only a short period of say ten seconds or so. Before the balance is lost, the magician will pick up the egg and hand it to the audience. The audience will try and fail. The trick-eggs, in my view, do not actually belong in this list as they are not puzzles, but I keep them in to show the contrast with real balance puzzles.
- **Twisty** — this relates to the fact that the puzzle itself can be altered, by twisting or shifting. Most balance puzzles have moving parts, but only internally and they cannot be controlled directly. With twisty puzzles you do have direct control, turning, shifting or otherwise altering the puzzle.
- **Logic** — A balance puzzle generally leaves you in the dark as to what can or needs to be done, but observation (feeling and hearing) combined with creativity and logic may and/or will help you find a solution. Logic is generally combined with **path** or **dexterity**.
- **Dexterity** — with dexterity the manipulation of the object —the egg— is meant: tilting, shifting, flipping, etc. When a puzzle has a high level of dexterity, it may take a lot of practise.

Most balance puzzle are characterized by combinations of the above.

Relating dexterity a further deliberation is required. Almost every puzzle requires a level of dexterity. Personally I would classify a puzzle as a dexterity puzzle if you fail more often than you succeed and if you cannot use logic to turn the odds.

Solving balance puzzles

Solving a balance puzzle starts by investigating the puzzle. When you solve any puzzle you start by making some observations. In the case of balance puzzles your eyes are not given a lot of clues, so you need to rely on your other senses, mostly hearing and feeling, as smelling and tasting generally do not really help with puzzles...

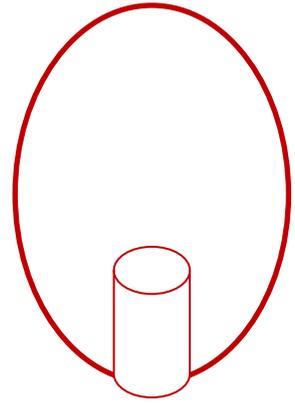
At this stage the object is to determine the type of balance puzzle. Based on the suspected mechanism, or combinations of mechanisms, you start looking for further clues. If it is a well-known mechanism the task may be relatively straightforward, but if it is new then the problem is much more difficult. You need to imagine a new mechanism and “look” for clues. Looking in this context is, again, mostly feeling and hearing. This is the part that can be really satisfying or extremely frustrating. Satisfying if your suspicion was right and you find the path or logic and solve the puzzle. Frustrating if you cannot find the path, cannot imagine the new mechanism, cannot explain what is happening.

At this point two other qualities enter the equation: patience and perseverance. Admittedly, I do not always have enough of these qualities to solve a puzzle by myself. Let me give you two examples: one with some success and one with defeat.

L'UOVO DI COLOMBO – puzzle #8

When I purchased this puzzle and received it, I was very disappointed. I felt cheated. This was an impossible puzzle. Just a hollow egg with a tube in the tip and a ball. The only way to balance it would be to repeatedly flip the egg and to try and catch the egg with the tube – virtually impossible. I did manage to do it once or twice, but I could not deliberately repeat it. For years I cursed this “puzzle”, I didn't consider it as a valid puzzle. Only recently while i was writing this article I got an

insight. I was trying to prove to myself that this indeed was not a valid puzzle, that it only is a game of chance; that no logic would help solving this puzzle. Then it hit me: this puzzle can be solved with logic. I should hold the puzzle upside down with the tube straight above the ball, than the only thing needed would be to move the tube down quicker than gravity, to catch the ball. After I got this idea I stood up tried it once and failed; tried it another time....success! Right now I cannot deliberately repeat it, but I demonstrated to myself that logic actually helped me to balance this egg. Still, the level of dexterity of this puzzle is very high, which still makes me qualify this as a bad puzzle. Or should I believe in a better solution and persevere?



Ze Balancing Egg – puzzle #15

This egg was a mystery to me. I initially thought this was a traditional balancing puzzle with some groove and a volcano to centralize the ball. You can feel the base of the volcano because the ball circles around it, but I could not feel any sign of a groove. I felt cheated, like with *L'UOVO DI COLOMBO*. I basically had given up, but in the back of my mind I thought this could not be true. It is an IPP puzzle, so there should be a solution. This puzzle was from IPP 35 in 2015, but the souvenir book of that IPP has not been distributed yet. So I contacted the organisers and asked for the solution. After I saw the solution it was still a challenge. My original suspicion was correct – it is a more or less traditional balancing egg. The groove is very hard to “feel”. Thanks to a marking on the outside of the egg —very tiny and easily mistaken for random damage— I finally found the groove. But then unlike the traditional balance puzzle you are supposed to flip the ball into the volcano. Initially this disappointed me, but after a bit of thinking I found out that it should not be a “flip”, but just a vertical toss while turning the egg upright. Almost always, but at least one out of two tries I succeed in solving the puzzle. Love it!

Balance puzzles — you either love them or hate them

I have read comments on the Internet from people talking about balance puzzles. They argue that balance puzzles are not really puzzles, but dexterity games. This suggests that solving balance puzzles requires mainly dexterity and no logical thinking. I hope to have shown that most balance puzzles do require logic and creative thinking (out-of-the-box thinking). The main difference is that you need to rely on sound and feeling instead of sight. So, balance puzzles can be a lot of fun and very satisfying once you have cracked the solution. Otherwise you will probably curse them and try to avoid them.

Acknowledgements

Thanks go to the Lilly Library in Bloomington, Indiana, USA where I have studied several of the balance puzzles. Thanks also go to James Dalgety. I found and studied several balance puzzles at the puzzle museum at his house. Thanks also go to Joop van der Vaart who has helped eliminating errors in this manuscript.

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- [1] https://en.wikipedia.org/wiki/World%27s_Columbian_Exposition.
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- [3] Professor Hoffmann, *Puzzles Old and New*, 1893, Chapter II, LII.
- [4] Girolamo Benzoni, *History of the New World*, Venice, 1565, p. 12.
- [5] <http://robspuzzlepage.com/dexterity.htm>.