haStec Laboratoire d'Excellence Histoire et anthropologie des savoirs, des techniques et des croyances

École Pratique des Hautes Études | PSL

Laboratoire d'Excellence HASTEC

Rapport d'activité final
Contrat Post-doctoral
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par
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« JOUER AVEC LES SCIENCES »

Laboratoire de rattachement : IHMC/Paris 1
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Axe de recherche N°1 : « Espaces apprenants et circulation des savoirs »
Axe de recherche 5 : « Mondes sociaux, espaces et productions de savoirs »

Sommaire

NB = Il est possible d'intégrer à ce rapport le texte d'un article sous presse, ou un « working paper »

1. Résumé du projet de recherche

Jouer avec les sciences.
Cartes à jouer et jeux de société au regard de l'histoire des savoirs à l'époque moderne (1750-1830).

Le projet vise à étudier les cartes à jouer et les jeux de société à thème scientifique conçus et publiés entre le XVIIIème et le XIXème siècle en Europe, en se concentrant d'abord sur la figure de John Wallis et ses fils, éditeurs londoniens. Comme de nombreux chercheurs l'ont bien démontré ces dernières années (Séville, 2019; O'Bryan, 2017; Levy, 2017), l'histoire des jeux peut nous donner beaucoup d'informations sur les pratiques culturelles: les jeux doivent être considérés comme «faisant partie d'une narrative culturelle plus vaste», comme le dit O'Bryan (O'Bryan, 2017, p. 17). On peut dire que les jeux «ne sont pas un jeu». Ce sont plutôt des «boundary objects» (Star, Griesemer, 1989): des objets concrets, qui ont traversé des époques et des lieux, des classes sociales et des contextes culturels différents, et qui, pour cette raison, sont profondément fascinants et significatifs. De plus, par leur propre nature, ils remettent encore une fois au défi la notion problématique (et déjà très discutée) de «culture populaire» et ouvrent facilement la voie à l'étude des interactions et des échanges entre circuits savants et circuits profanes, des cultures hautes et basses et de leurs lignes de démarcation si floues et si transitoires.
L'idée de se concentrer spécifiquement sur les jeux à thème scientifique est basée sur deux raisons principales: d'une part, le fait que nous avons un large corpus de sources primaires encore largement inexploré, qui mérite certainement d'être considéré; d'autre part, l'opportunité −du point de vue historiographique remarquable − non seulement de contribuer à l'histoire des jeux, mais aussi de mettre ce thème en dialogue avec les études sur la «science populaire» et sur l'histoire de la vulgarisation scientifique et avec celles d'histoire matérielle et visuelle de la science. En ce qui concerne le premier point, les archives offrent une quantité importante de matériel qui n'a pas encore été systématiquement étudié.
Il faut d'abord préciser que, lorsque nous parlons de jeux à thème scientifique, nous faisons référence à tous les jeux où les sujets peuvent être attribués à ce que nous désignons conventionnellement par le terme de «science moderne» (voir Daston, Park, 2006, p. 3). Dans le cas des cartes à jouer et des jeux de société, nous avons principalement des titres liés à l'astronomie, à la philosophie naturelle et à l'histoire naturelle, mais aussi à l'arithmétique et aux inventions. Par exemple, en 1795, l'abbé Paris signa un jeu de cartes intitulé *Les éléments de l'astronomie et de la géographie: expliqué sur 40 cartes* (abbé Paris, 1795) et Alicia Catherine Mant, en 1814, conçut un jeu d'astronomie. Parmi les jeux produits par John Wallis, on retrouve les jeux de société *Un passe-temps arithmétique: destinés à infuser les rudiments de l'arithmétique, sous l'idée d'amusement* (Wallis, 1798), *Science in sport, ou, Les plaisirs de la philosophie naturelle. Un nouveau jeu* (Wallis, 1805), ainsi que *The naturalist: a new game, moral and instructive* (Wallis, 1814), tandis que son fils Edward également imprima *Le nouveau jeu de génie de Wallis, ou, Compendium of inventions* (Wallis, 1830).
En ce qui concerne le deuxième point, il est clair que l'étude de ces sources primaires peut nous aider à tenter de répondre à certaines questions pertinentes qui peuvent contribuer de manière significative aux études de la «science populaire» et à l'histoire de la communication scientifique, ou vulgarisation (sur l'utilisation de ces termes, voir Secord, 2004; Govoni, 2009). Tout d'abord, les études qui ont traité de l'histoire des jeux et des cartes (Séville, 2019; O'Bryan, 2017; Levy, 2017) ne se sont jamais spécifiquement concentrées sur la conception, la circulation et le succès des jeux à thème scientifique.

Néanmoins, nous avons un corpus intéressant, quoique limité, d'études sur les «sciences récréatives»: certains travaux (par exemple Belhoste et Hazerbout, 2014; Otis, 2017) ont attiré l'attention sur des initiatives éditoriales où la science (à savoir les mathématiques) était présentée au public comme une activité récréative et de passe-temps par le biais d'astuces, d'énigmes, etc. La question serait alors: en supposant qu'il existe un *continuum* (et ce projet visera approfondir cette question) qui va des travaux de vulgarisation scientifique aux travaux de science récréative, en passant par la didactique, où ces cartes et jeux de société devraient-elles être placés et pourquoi. La question n'est pas négligeable: comme nous le savons déjà de l'histoire des jeux, en fait, certains jeux de cartes ou de jeux de société ont été conçus comme des outils pédagogiques et souvent vendus en annexe aux manuels scolaires (Sheffrin, 1999). Il serait donc intéressant de comprendre dans quelle mesure les jeux à thème scientifique étaient destinés à être des outils éducatifs ou récréatifs et à quel public ils s'adressaient, mais aussi quel public ils atteignaient réellement et dans quels contextes, lieux et environnements sociaux ils étaient utilisés. D'autres aspects sont directement liés à la conception et à la production de ces types de jeux: qui les a conçus? Où ont-ils été produits et vendus? Pour certains d'entre eux, nous avons déjà quelques informations, mais nous en avons besoin de plus, afin de tracer un cadre cohérent et solide. Il sera en effet important de comprendre comment ces initiatives d'édition ont été conçues et réalisées et comment elles se sont développées. Une autre question serait: ont-ils rencontré la faveur du public et, le cas échéant, dans quelle mesure, comparés aussi à d'autres jeux? Enfin, il sera essentiel d'analyser si, comment et à quelle vitesse les développements scientifiques, les découvertes et les débats ont influencé le contenu des jeux. En bref: quelle était la relation entre la science moderne et les jeux? Dans quelle mesure la première a-t-elle pénétré les seconds? Et dans quelle mesure ces jeux ont-ils contribué à la circulation des connaissances scientifiques en dehors des circuits appris?

Dans ce contexte, il est clair que cette recherche va aussi s'insérer dans l'histoire matérielle et visuelle de la science, en contribuant notamment à l'étude de la circulation des instruments et objets scientifiques dans de divers circuits, de leur emploi et de leurs transformations. Plus généralement, le thème sera un apport important aux travaux sur la circulation et transmission des savoirs, en utilisant une perspective presque inédite.

Dans le cas où une bourse Labex Hastec me serait accordée, une partie du projet pourra être développée: dans cette première phase, se concentrerait sur la figure déjà mentionnée de John Wallis et de ses fils. Ces éditeurs, basés à Londres, ont créé et vendu une large série de jeux de société et de cartes à jouer à cheval sur le XVIIIème et XIXème siècle, parmi lesquels de nombreux jeux étaient à thème scientifique. D'une part, il sera nécessaire de recueillir plus d'informations sur les Wallis, qui sont généralement cités et rappelés dans les ouvrages consacrés à l'histoire des jeux; toutefois, aucune étude ne s'est jamais focalisée spécifiquement sur eux, leur activité et leur histoire. D'autre part, l'objectif du projet nous amènera à circonscrire notre attention aux jeux à thème scientifique qu'ils ont publiés. Les principales sources que nous examinerons ensuite sont conservées, généralement en peu d'exemplaires, dans plusieurs bibliothèques, principalement mais pas seulement en Angleterre:

Abbé Paris (1795), *The elements of astronomy and geography: explained on 40 cards*, London: John Wallis. Dans la Bibliothèque de l'Université de Oxford Library, Oxford (UK).

John Wallis (1798), *An arithmetical pastime: intended to infuse the rudiments of arithmetic, under the idea of amusement*, London: Printed by Biggs and Co. for John Wallis. Dans les Archives du Victoria and Albert Museum, Londres.

- (1805), *Science in sport, or, The pleasures of natural philosophy. A new game*, London: J. Wallis. À l'Université de Yale.
- (1813) *The naturalist: a new game, moral and instructive*, [London]: John Wallis. Dans la Bibliothèque The Morgan, New York.

Edward Wallis (1815), *Science in Sport or the Pleasures of Astronomy*, London: E. Wallis. Dans les Archives du Victoria and Albert Museum, Londres.

- (1818), *Wallis's Elegant and Instructive Game Exhibiting the Wonders of Nature, in Each Quarter of the*
World, London: Edward Wallis. Dans la British Library, Londres.
- [1830 ca], *Wallis's new game of genius, or, Compendium of inventions connected with the arts, sciences, and manufactures: accompanied by a descriptive book and designed for the amusement and instruction of youth of both sexes*, [London]: E. Wallis. Dans la Collection de Carl H. Pforzheimer, Shelley and His Circle, New York.

Outre les jeux eux-mêmes, d'autres types de sources primaires seront envisagés et analysés, afin de collecter des informations et des détails sur l'utilisation, la diffusion, la circulation et la réception de la production de Wallis, c'est-à-dire, par exemple, les textes imprimés avec les instructions de jeux, les gazettes annonçant une nouvelle sortie des presses de Wallis et les correspondances privées, manuscrits ou textes imprimés faisant référence à ces jeux.

En ce qui concerne les axes de recherche, le point le plus intéressant de ce projet est qu'il s'insère parfaitement, parmi les thématiques du Labex Hastec, dans l'Axe 5 «Mondes sociaux, espaces et productions de savoirs», mais il croise aussi l'Axe 1 «Espaces apprenants et circulation des savoirs» . Le choix des jeux comme objets de recherche, en fait, débouche sur une série importante des questions remarquables appartenant à ces deux axes. A l'égard de l'Axe 5, il est évident que le projet s'interrogera sur la production des savoirs en cherchant à la mettre en relation avec leur circulation, diffusion et réception.

La dimension de la vulgarisation, en fait, permettra d'examiner les dynamiques autour desquelles les savoirs étaient transmis hors des circuits savants à travers les jeux et comme ils transforment et sont transformés par les diffèrent contextes sociaux et espaces, à travers des interactions mutuelles. A l'égard de l'Axe 1, les jeux à thèmes scientifiques et leur circulation montrent une dimension presque inédite et très stimulante sur les modalités et les espaces de l'apprentissage et de la didactique, et au même temps sur la circulation des savoirs scientifiques dans plusieurs des espaces apprenants. Aussi les axes de recherche spécifiques à l'Institut d'Histoire Moderne et Contemporaine sont bien appropriés au projet. Premièrement, l'Axe 3. Savoirs et patrimoines, qui traite de l'histoire des savoirs concernant leur circulation et transformation dans divers contextes, ce qui est également le cœur aussi de mon projet. En outre, les jeux en tant qu'objets de recréation, d'apprentissage ou, plus simplement, d'un process créatif, incarnent pleinement ce dépassement des découpages disciplinaires entre sciences, techniques ou arts et permettent de se confronter, une fois de plus, avec leur échanges et entrelacs.

L'élément le plus significatif, néanmoins, est l'accent mis par l'IHMC sur les «objets frontière»: j'ai toujours pensé aux jeux à thème scientifique, en fait, comme de «boundary objects», suivant la définition de Star et Griesemer, et c'est une de mes motivations principales, sinon *la* motivation principale, qui m'a portée à considérer l'IHMC et ses groupes de recherche comme le lieu le plus indiqué pour réaliser cette recherche. Enfin, aussi l'Axe 4. Mobilité et échanges est très proche du projet que je présente, dans la mesure où il s'interroge sur la circulation de ces jeux, développés et produits en Angleterre mais vendus et utilisés dans, et probablement hors de, l'Europe moderne.

2. Développement et résultats de la recherche

Par rapport à ce qui était écrit dans le projet initial et rapporté ci-dessus, il faut souligner que certains objectifs n'ont pas été atteints ; d'autre part, la recherche a ouvert des pistes inattendues.

En raison de la pandémie de Covid d'abord, et d'une grossesse gémellaire et de la relative maternité ensuite, je n'ai pas fait le voyage que j'avais prévu à Londres. Je n'avais donc pas accès aux bibliothèques et archives où j'avais prévu d'aller. Cela n'a pas causé beaucoup de problèmes pour ce

qui concerne l'étude des jeux. En effet, grâce aux numérisations qui m'ont été fournies par les bibliothèques anglaises et américaines et grâce à un site italien (www.giochidelloca.it) qui met à disposition une riche collection de jeux d'oie, j'ai pu retrouver presque tout le matériel dont j'avais besoin.
Cependant, je n'ai pas eu l'occasion de consulter les archives anglais pour vérifier s'il existait des sources de première main sur la circulation des jeux des Wallis, par exemple dans des correspondances privées ou dans la documentation relative à leur activité commerciale (registres des copies imprimées et des copies vendues). D'autre part, la recherche m'a permis d'identifier les jeux de cartes et les jeux de société à thématique scientifique également en France et de m'interroger sur les relations entre Paris et Londres par rapport à la création de jeux éducatifs. Enfin, j'ai élargi l'amplitude des recherches du point de vue chronologique, en identifiant trois précieuses sources matérielles anglaises, remontant aux premières années du XVIIIe siècle.
Je tiens également à souligner que certaines des copies numérisées des jeux des Wallis portent des inscriptions manuscrites, que j'ai analyser avec toute l'attention qu'elles exigent, car ce sont de véritables, précieuses traces de ceux qui ont effectivement utilisé ces jeux.

2.1. Liste des Sources Primaires Identifiées

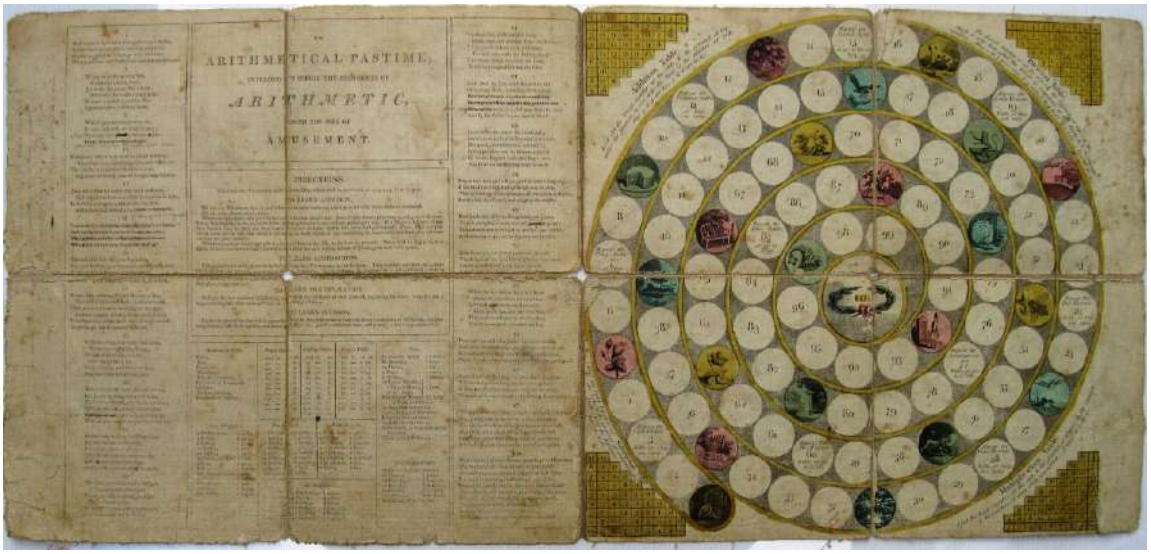
Liste des jeux des Wallis

Mon travail s'est d'abord concentré sur la recherche des sources primaires à analyser. Vous trouverez ci-dessous une liste des jeux identifiés et analysés, avec les images et les liens. Certains des jeux édités par les Wallis ont survécu en un ou seulement quelques exemplaires (comme le jeu de cartes *The Structure of the Earth*); ce sont donc des sources primaires d'une grande fascination et d'une grande importance, qui n'avaient jamais été étudiées à ce jour.
Il est utile de spécifier que chaque jeu, à l'exception de quelques titres (les jeux de cartes et le jeu sur l'arithmétique), se composait d'un plateau de jeu et d'un livre d'instructions, qui donnait aux joueurs des informations presque toujours approfondies et détaillées, à l'égard du sujet scientifique au centre du jeu. C'est une caractéristique fondamentale, qui nous signale l'authenticité des intentions des éditeurs, qui souhaitaient proposer des jeux éducatifs, qui puissent "enseigner en s'amusant" et qui devaient donc être captivants mais toujours instructifs. C'est au même temps cette caractéristique qui marque, on le verra, la distance entre la version anglaise de ces jeux et leur publication et circulation en France.

Titre	**Source**
Elisabeth Newbery; John Wallis (1790). *The New Game of Human Life, with rules for playing: being the most agreeable & rational recreation ever invented for youth of both sexes*. London : John Wallis; E. Newbery.	JEU téléchargé http://www.giochidelloca.it/scheda.php?id=144 INSTRUCTIONS téléchargées http://www.giochidelloca.it/scheda.php?id=144

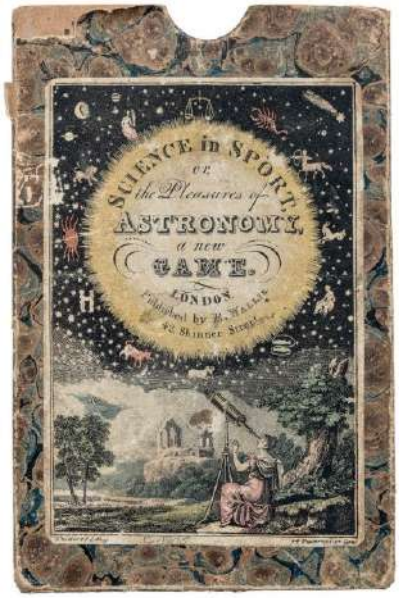
Abbé Paris (1795). *The elements of astronomy and geography: explained on 40 cards*, London: John Wallis.	JEU téléchargé https://catalog.lindahall.org/discovery/delivery/01LINDAHALL_INST:LHL/1288226440005961?lang=en INSTRUCTIONS avec le jeu

John Wallis (1798). *An arithmetical pastime: intended to infuse the rudiments of arithmetic, under the idea of amusement.* London: Printed by Biggs and Co. for John Wallis.	JEU téléchargé http://www.giochidelloca.it/scheda.php?id=1273 INSTRUCTIONS avec le jeu



Margaret Bryan; John Wallis (1805). *Science in Sport, or the Pleasures of Astronomy; A new & instructive pastime*. London. John Wallis.	JEU téléchargé https://collections.rmg.co.uk/media/450/675/f6442_002.jpg INSTRUCTIONS téléchargées http://www.giochidelloca.it/scheda.php?id=1384

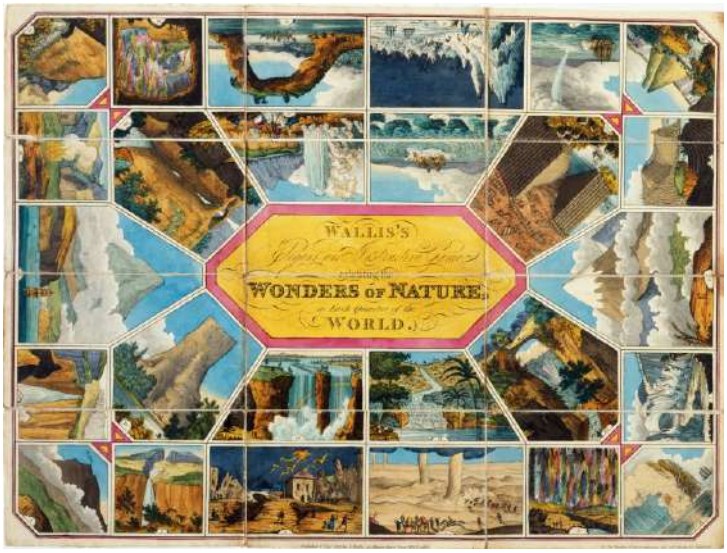
Deuxième édition Edward Wallis (1815), *Science in Sport or the Pleasures of Astronomy*. London: E. Wallis.	JEU téléchargé http://www.giochidelloca.it/scheda.php?id=1384; Chicago Library. INSTRUCTIONS téléchargées



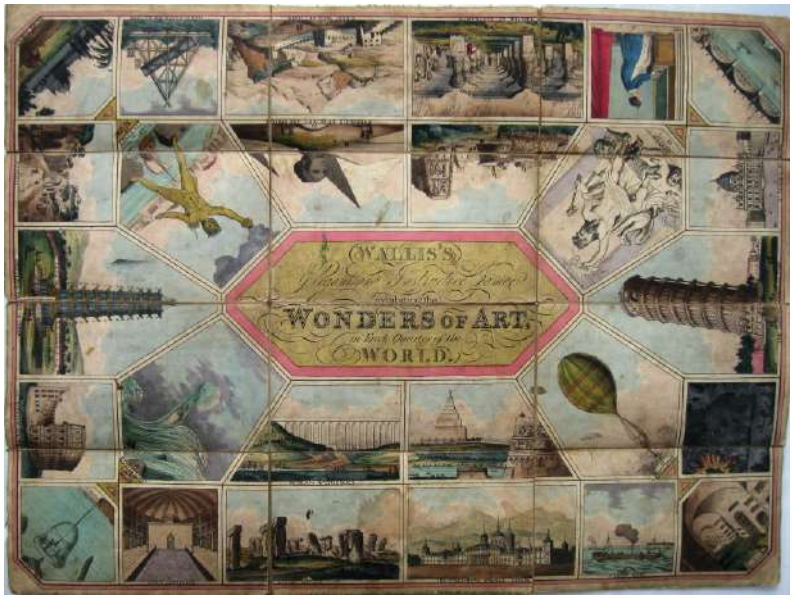
John Wallis (1805). Science in sport, or, The pleasures of natural philosophy. A new game, London: J. Wallis.	JEU téléchargé http://www.giochidelloca.it/scheda.php?id=1260 INSTRUCTIONS téléchargées https://iiif.lib.harvard.edu/manifests/view/drs:460494616$4i
Deuxième édition par Edward Wallis Edward Wallis (1815), Science in Sport or the Pleasures of Natural Philosophy, London: E. Wallis.	JEU https://iiif.lib.harvard.edu/manifests/view/drs:460494616$3i PAS D'INSTRUCTIONS

John Wallis (1813). *The naturalist: a new game, moral and instructive*, [London]: John Wallis.	JEU copie numérique par la Morgan Library (New York) INSTRUCTIONS copie numérique par la Morgan Library (New York)

Edward Wallis (1818), *Wallis's Elegant and Instructive Game Exhibiting the Wonders of Nature, in Each Quarter of the World*. London: Edward Wallis.	JEU téléchargé http://www.giochidelloca.it/scheda.php?id=1299 INSTRUCTIONS téléchargées http://www.giochidelloca.it/scheda.php?id=1299

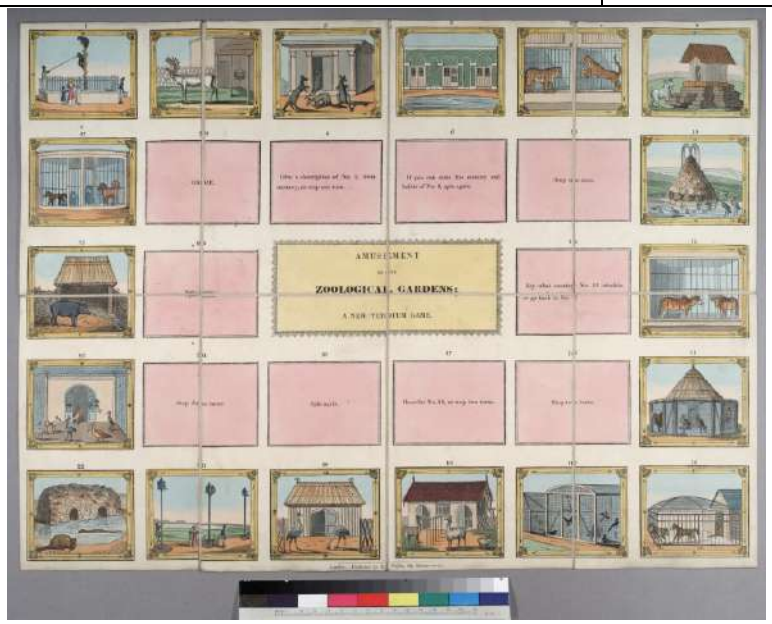


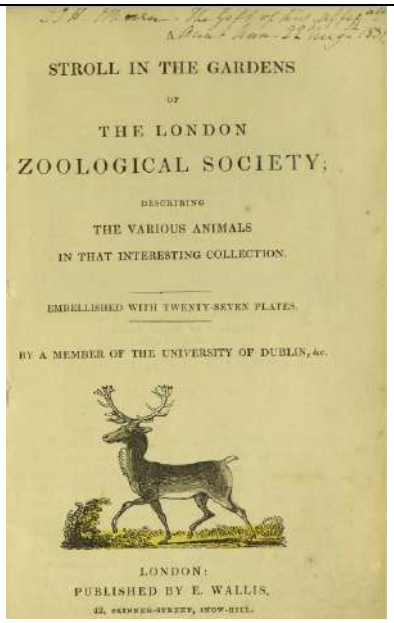
Edward Wallis (1820). *Wallis's Elegant and Instructive Game exhibiting the Wonders of Art in Each Quarter of the World*. Edward Wallis: London.	JEU telechargé http://www.giochidelloca.it/scheda.php?id=2214 INSTRUCTIONS télechargées http://www.giochidelloca.it/scheda.php?id=2214



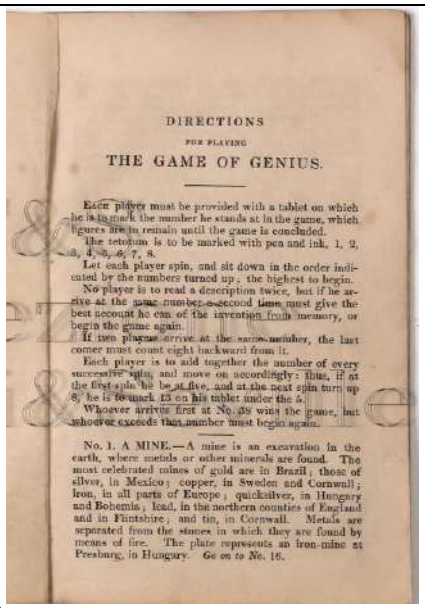
Edward Wallis [1830]. *Wallis's new game of wanderers in the wilderness*. Edward Wallis: London.	JEU telechargé http://www.giochidelloca.it/scheda.php?id=1332 INSTRUCTIONS télechargées http://www.giochidelloca.it/scheda.php?id=1332

Edward Wallis [1831 ca]. *Amusement in the zoological garden. A new game*. London : E. Wallis.	JEU copie numérique par la Huntington Library INSTRUCTIONS copie numérique (avec des inscriptions) par la Huntington Library




STROLL IN THE GARDENS
OF
THE LONDON
ZOOLOGICAL SOCIETY;
DESCRIBING
THE VARIOUS ANIMALS
IN THAT INTERESTING COLLECTION.
EMBELLISHED WITH TWENTY-SEVEN PLATES.
BY A MEMBER OF THE UNIVERSITY OF DUBLIN, &c.
LONDON:
PUBLISHED BY E. WALLIS,

Edward Wallis [1830 ca]. *Wallis's new game of genius, or compendium of inventions connected with the arts, sciences and manufactures. Accompanied by a descriptive book and designed for the amusement and instruction of youth of both sexes*. [London]: E. Wallis.	JEU téléchargé http://www.giochidelloca.it/scheda.php?id=2700 INSTRUCTIONS téléchargées http://www.giochidelloca.it/scheda.php?id=2700



DIRECTIONS

FOR PLAYING

THE GAME OF GENIUS.

Each player must be provided with a tablet on which he is to mark the number he stands at in the game, which figures are to remain until the game is concluded.

The tetotum is to be marked with pen and ink, 1, 2, 3, 4, 5, 6, 7, 8.

Let each player spin, and sit down in the order indicated by the numbers turned up; the highest to begin.

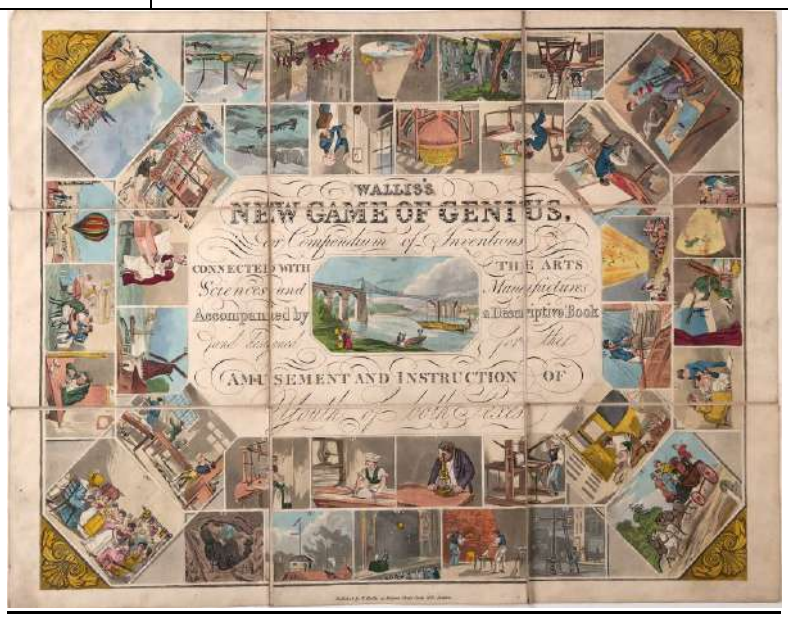
No player is to read a description twice, but if he arrive at the same number a second time must give the best account he can of the invention from memory, or begin the game again.

If two players arrive at the same number, the last comer must count eight backward from it.

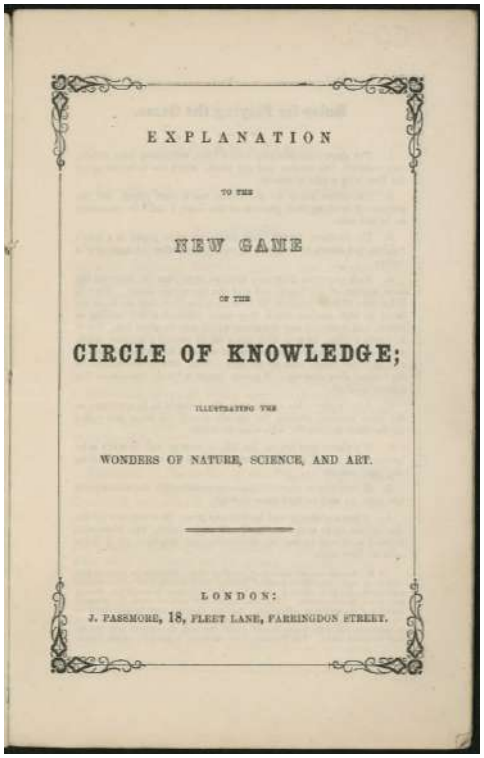
Each player is to add together the number of every successive spin, and move on accordingly: thus, if at the first spin he be at five, and at the next spin turn up 6, he is to mark 13 on his tablet under the 6.

Whoever arrives first at No. 88 wins the game, but whoever exceeds that number must begin again.

No. 1. A MINE.—A mine is an excavation in the earth, where metals or other minerals are found. The most celebrated mines of gold are in Brazil; those of silver, in Mexico; copper, in Sweden and Cornwall; iron, in all parts of Europe; quicksilver, in Hungary and Bohemia; lead, in the northern counties of England and in Flintshire; and tin, in Cornwall. Metals are separated from the stones in which they are found by means of fire. The plate represents an iron-mine at Presburg, in Hungary. Go on to No. 16.



Edward Wallis [après 1846]. *The circle of knowledge*. London: John Passmore.	JEU copie numérique par le Museum of Applied Arts and Sciences (MAAS), Sidney. INSTRUCTIONS copie numérique par le Museum of Applied Arts and Sciences (MAAS), Sidney.



EXPLANATION

TO THE

NEW GAME

OF THE

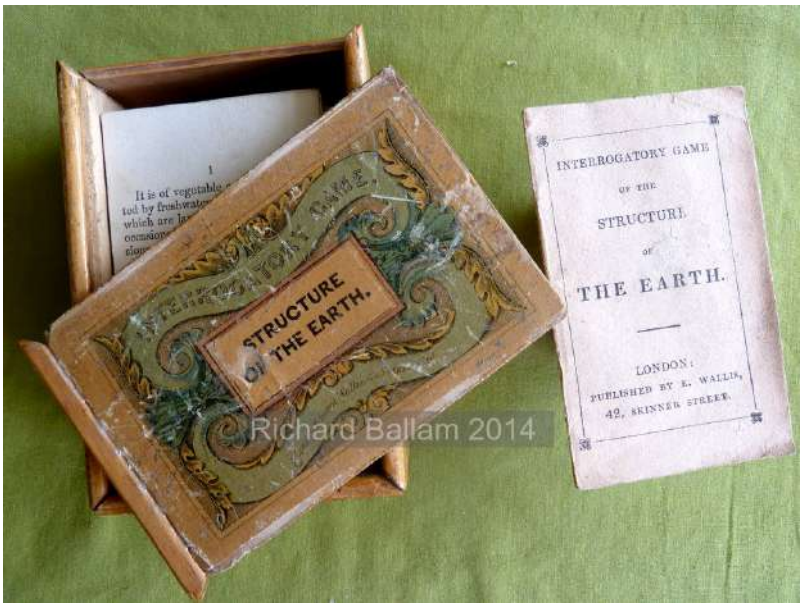
CIRCLE OF KNOWLEDGE;

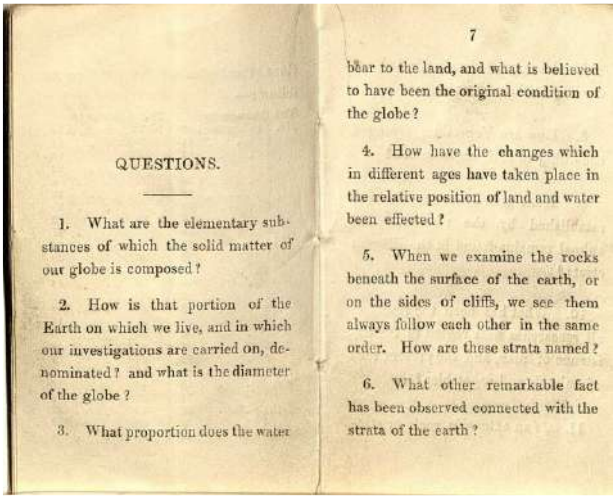
ILLUSTRATING THE

WONDERS OF NATURE, SCIENCE, AND ART.

LONDON:
J. PASSMORE, 18, FLEET LANE, FARRINGDON STREET.

Edward Wallis [1830]. *Interrogative Game on the Structure of the Earth*. London: Edward Wallis.	JEU et INSTRUCTIONS copie numérique par la Collection Ballam (John Johnson Collection, Bodleian Library, Oxford UK).





QUESTIONS.

1. What are the elementary substances of which the solid matter of our globe is composed?

2. How is that portion of the Earth on which we live, and in which our investigations are carried on, denominated? and what is the diameter of the globe?

3. What proportion does the water

7

bear to the land, and what is believed to have been the original condition of the globe?

4. How have the changes which in different ages have taken place in the relative position of land and water been effected?

5. When we examine the rocks beneath the surface of the earth, or on the sides of cliffs, we see them always follow each other in the same order. How are these strata named?

6. What other remarkable fact has been observed connected with the strata of the earth?

1

It is of vegetable origin, deposited by freshwater in beds, between which are layers of stone and clay, occasioned by successive immersions in the sea, and subsequent elevations. The Coal district of England extends in a waving line from Northumberland in the North, to Devonshire in the South. In South Wales it occurs throughout a surface of 1200 square miles, and in 33 beds, making a total thickness of 95 feet. Each square mile yielding 32 millions of tons; sufficient for the entire consumption of England for one year.

2.

They are composed of Silex, Alumina, Magnesia, and Water. They are easily split into thin lamina or scales, which are perfectly transparent, and of a glittering brilliancy. The former is elastic, but the latter, though flexible, is not so.

3.

In these called Transition, and they consist principally of Univalve Shells, divided into cells, or chambers, Corallines and other Radiated animals, with a particular kind of Crustacea, something like a small lobster, but having the body divided by lines from the head to the tail into three segments or lobes, and hence called Trilobites. The plants are of the most simple or Cellular kinds, as Sea-weeds.

4.

Most assuredly; for they prove,
1. That every thing but God had a beginning. "God created the heavens and the earth" and nothing arose from mere chance.
2. That the form of the earth was not at first visible, nor was it the abode of created beings. Being wholly covered by water, it is declared to have been "without form and void."
3. That God making portions of the land to emerge from the deep, separated the one from the other, or "said let the dry land appear."
4. That the earth brought forth vegetables.
5. That the animals inhabiting the waters were first created, afterwards birds, and then mammalia: the last of which was Man, possessing every faculty in the highest perfection.

5

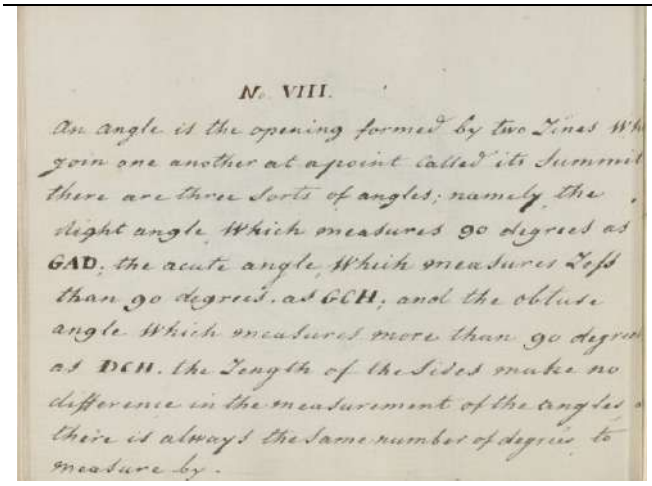
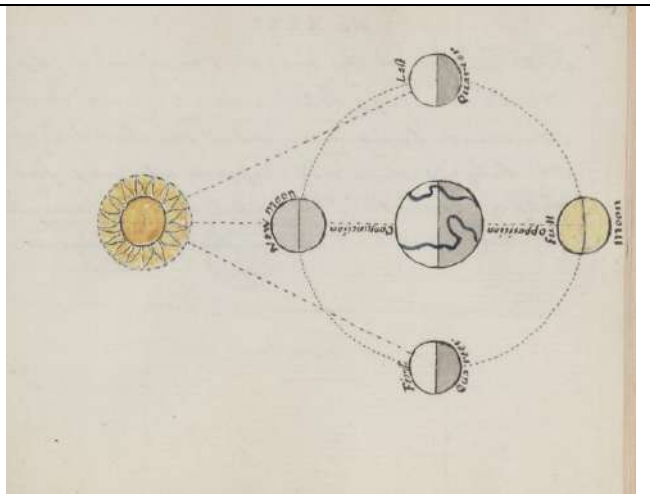
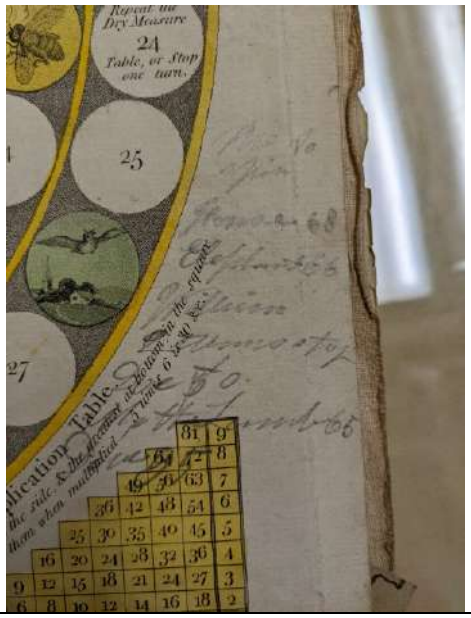
An original elementary principle, (see answer to question No. 1) entering largely into all vegetables, charcoal, and common coal, and which, united with oxygen, composes nearly half the substance of Limestone. Diamonds are pure Carbon.

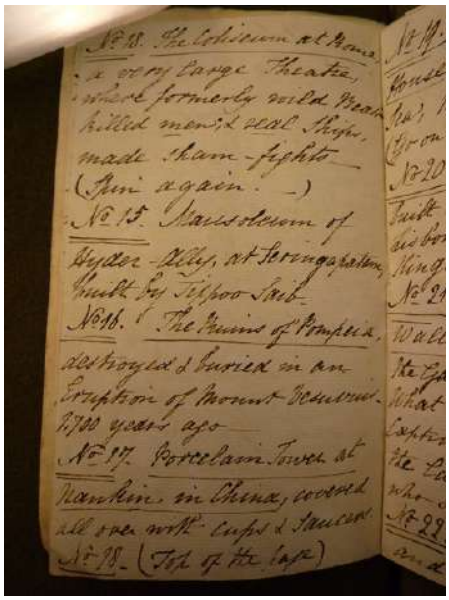
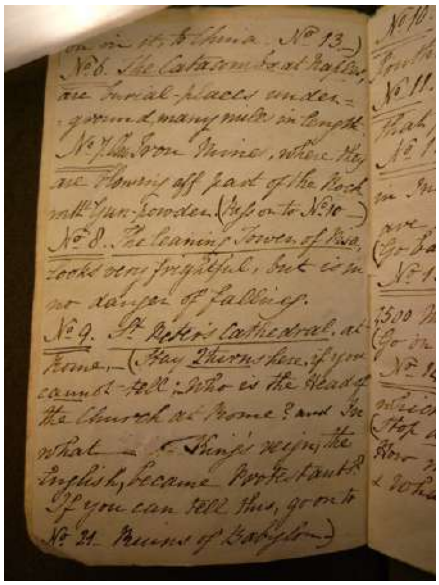
6.

A fibrous white stone, which may be split into threads, and woven into an incombustible cloth. It is found in considerable quantities, between beds of Serpentine, in the Isle of Anglesea in Wales.

De Clay, Mademoiselle (1829). *The Science of Botany according to the System of Linnaeus*. London: Edward Wallis.	En attendant la copie numérique par la Princeton Library https://catalog.princeton.edu/catalog/9951807333506421

Sources Manuscrites	
Demonstrations par Pechell, Charlotte, Lady Brooke, 1759-1841 (before 1841?)	Télechargé https://lindahall.alma.exlibrisgroup.com/discovery/delivery/01LINDAHALL_INST:LHL/12867760

	[90005961](#) Il est probable que Lady Pechell a copié les cartes de l'abbé Paris pour enseigner l'astronomie à ses enfants, dans la cadre d'une éducation domestique.
 N. VIII. An angle is the opening formed by two Lines Wh join one another at a point called its Summit there are three Sorts of angles; namely, the Right angle Which measures 90 degrees as GAD, the acute angle, Which measures Less than 90 degrees. as GCH, and the oblust angle Which measures more than 90 degrees as DCH. the Length of the Sides make no difference in the measurement of the angles their is always the same number of degrees to measure by.	
John Wallis (1798). *An arithmetical pastime: intended to infuse the rudiments of arithmetic, under the idea of amusement.* London: Printed by Biggs and Co. for John Wallis.	Copie avec des inscriptions manuscrites, à la Bibliothèque de l'Université de Princeton. Les inscriptions montrent que le jeu avait été donné comme cadeau de Noel par des parents à leur fils.
 Repeat the Dry Measure 24 Table, or Stop one turn. 25 27 Table	 1821 1820

Edward Wallis (1820). *Wallis's Elegant and Instructive Game exhibiting the Wonders of Art in Each Quarter of the World*. Edward Wallis: London.	Cet exemplaire, tiré de la collection de Seville/Ciompi sur le site www.giochidelloca.it, porte ces pages manuscrites. Ce sont les instructions réécrites en un forme synthétique et simplifiée. Il est probable que le père ou la mère (ou le précepteur ?) de l'enfant avait modifié les instructions dans leur version originale pour rendre le jeu plus facile ou plus agréable.
	

Liste des jeux françaises

Le jeu *The New Game of Human Life*, publié par J. Wallis en 1790 et traduit du français, et le jeu de cartes *The elements of astronomy and geography*, signé par un Français exilé à Londres, l'abbé Paris, qui publiera plus tard le jeu également en France après son retour dans son pays natal, ils m'ont amené à élargir le champ de mes recherches et à m'interroger d'abord sur les relations entre la France et l'Angleterre. Ainsi ont émergé des jeux à thème scientifique imprimés à Paris, pour la plupart au début du XIXe siècle, au sein de la célèbre « imagerie de la rue Saint Jacques ». Ces jeux partagent les thèmes avec les jeux anglais ; cependant, les nombreuses différences nous obligent à réfléchir sur les dynamiques par lesquelle ces jeux ont changé en fonction des contextes.

CREPY J. B., *Le nouveau Jeu des Ballons Aérostatiques*, Paris : Crepy, 1784.	
JOUY, V. J. E., *Neuvième jeu de cartes instructives, contenant un abrégé de l'histoire des animaux, avec des gravures. Ouvrage destine à l'instruction de la jeunesse des deux sexes*., Paris: Renouard/Nicolle, 1808.	
JEAN P., *Jeu des Fleurs,* Paris: Jean, 1810.	
JEAN P., *Nouveau Jeu d'Histoire Naturelle Dedié à la Jeunesse*, Paris: Jean, 1810.	
BASSET A. M., *Jeu Instructif d'Histoire Naturelle des Animaux*, Paris: Basset, 1815.	

BASSET A. M., *Jeu Instructif des Fleurs*, Paris: Basset, 1825.	
BASSET A. M., *Jeu Instructif des Merveilles de la nature et des arts*, Paris: Basset, 1825.	

Autres jeux anglais (XIXème siècle)

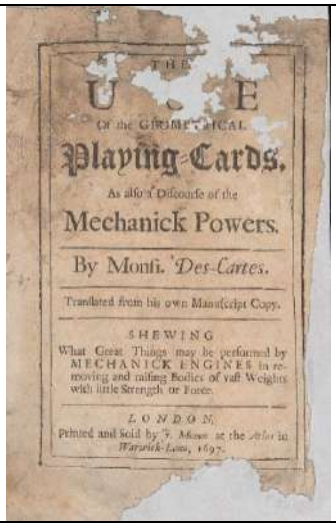
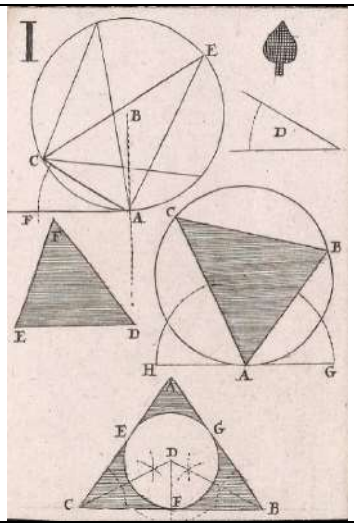
Revenant au côté anglais, il convient de souligner et de rappeler qu'aucun imprimeur ne présente un catalogue aussi riche des jeux à thématique scientifique que le Wallis. Cependant, dans un souci d'exhaustivité, il convient de mentionner les titres suivants, qui sont apparus dans les magasins des concurrents de John et Edward pendant les années de leur activité.

DARTON W., *British and Foreign Animals*, London: Darton, 1820.	
DARTON W., *British and Foreign Birds*, London: Darton, 1820.	 

CARVALHO D., *The New Game of Multiplication Table*. London: D. Carvalho, [1830-32 ca].	
BETTS J., *The Multiplication Table in Rhyme*. London: J. Betts, [1850 ca.].	

<u>Jeux anglaises entre XVII et XVIIIème siècle</u>

L'étude de la production de Wallis m'a poussé à essayer de comprendre quelle avait été la circulation des jeux à thème scientifique dans les décennies précédentes, considérant également que, en France, on en a déjà les premières traces à la fin du XVIIe siècle. En effet, j'ai identifié des très intéressants exemples : il s'agit de trois jeux de cartes qui ont pour sujet la mathématique. Le premier a été imprimé à Londres par Moxon, en 1697, avec la traduction en anglais d'un traité (en effet, une lettre) de Descartes sur la mécanique. Les deux autres, imprimés vers 1700 par Tuttel (toujours à Londres), sont dédiées à la mathématique (notamment, aux instruments mathématiques) et au calcul arithmétique (avec des démonstrations pratiques).

DESCARTES R. & [MOXON J.], *The use of the geometrical playing-cards, as also A discourse of the mechanick powers. By Monsi. Des-Cartes*. London: J. Moxon, 1697.		

TUTTEL, T., *Mathematical Cards*, London: s.n., [1701?].	 
[TUTTEL, T.?], *Arithmetical Cards*, London: s.n., s.d..	

2.2. Analyse synthétique des jeux

L'analyse des sources primaires a identifié certains aspects spécifiques, qui ont été décrits dans les articles et essais que j'ai écrits.

Pour ce qui concerne les jeux du catalogue de John et Edward Wallis, c'est-à-dire le sujet principal du projet LabexHastec, il y a des éléments communs qui marquent très clairement la manière dont le contenu scientifique a été choisi et transformé, à travers un processus qui visait une communication et représentation à la fois verbale et iconographique.

Premièrement, dans ces jeux on avait une coprésence du passé et du présents de la science : d'une part, les informations données reflétaient les derniers développements des connaissances scientifiques (comme témoigne très bien le jeu *The Structure of the Earth*, dédié à la géologie, à la chimie et au rapport entre les deux) ; d'autre part, les inventions, les découverts et les protagonistes étaient présentés dans leur dimension historique. Deuxièmes, la science était connotée, chose très typique de la vulgarisation de l'époque, comme familiale : les notions étaient souvent expliquées avec des exemples tirés de la vie quotidienne ; les joueurs étaient invités à reproduire des expériences avec des matériaux facilement repérables dans le milieu domestique ; en outre, beaucoup des inventions ou instruments décrits étaient bien connus hors de circuits cultivés. Enfin, il y a, dans les jeux des Wallis, une inextricable entrelacement entre science et enseignement morale : par exemple, dans le *New Game of Genius*, le progrès scientifique et technologique est raconté en donnant une valeur morale à

chaque invention. Les inventions «bonnes» font avancer les joueurs; les inventions «mauvaises» les font reculer ou passer leur tour. Donc la narration de la science n'est pas neutrale ; au contraire, c'est une narration qui vire à enrichir les connaissances des jeunes joueurs, mais aussi à les introduire à une vie vertueuse.

Cette dimension morale est totalement absente des jeux français à thème scientifique. En effet, ces jeux, comme on a déjà dit, partageaient les thématiques avec les jeux anglais, de la botanique à l'histoire naturelle. En particulier, le jeu de Basset de 1825, intitulé *Jeu Instructif d'Histoire Naturelle des Animaux*, semble fusionner deux jeux de Wallis, le *Game of Wonders of Nature* et le *Game of Wonders of Art,* publiés quelques années avant. Mais, comme j'ai cherché à démontrer dans l'article que j'ai soumis aux *Archives Internationales d'Histoire des Sciences*, on a aussi de nombreuses différences, qui suggèrent une utilisation et une circulation spécifiquement caractéristiques du contexte français. Alors que les jeux anglais s'adresseraient explicitement aux "jeunes des deux sexes" et que les livrets d'instructions détaillés donnent des notions précises de philosophie naturelle, d'astronomie ou de zoologie, les jeux français semblent privilégier la partie ludique, faisant en quelque sorte un clin d'œil à la dimension publique du "spectacle de la science", sans pour autant remplir la fonction pédagogique, même promise par le titre (comme dans les jeux de Basset). Par conséquence, il semble que le public et la circulation des versions françaises aient particulièrement hétérogènes et déconnectés de la dimension purement didactique typique du contexte anglais.

En tout cas, il est évident que les marchés français et anglais se sont influencés à plusieurs reprises : certains thèmes sont apparus pour la première fois en France, ont ensuite été introduits en Angleterre et sont revenus, sous une forme renouvelée, en France. Plus généralement, il faut souligner que les jeux éducatifs sont arrivés à Londres depuis la France, où les premiers titres remontaient au début du XVIIIe siècle. Dans ces années, en effet, ce sont les jésuites qui proposent à leurs élèves des jeux sur les blasons ou sur les fortifications à des fins didactiques. En Angleterre, les jeux éducatifs ont connu leur âge d'or au XIXe siècle ; dans le même temps, il semble qu'en France la fonction éducative diminue, notamment en ce qui concerne les jeux qui nous intéressent, c'est à dire ceux à thème scientifique.

Enfin, il vaut la peine de dire quelques mots sur les jeux de cartes anglais du XVIIIème siècle. Ils représentent une intrigante source matérielle et visuelle, qui nous impose à nous interroger sur la circulation de ces cartes, sur leur création et utilisation. En effet, il semble que les trois paquets étaient destinées à des public différents ; de plus, c'est plutôt difficile d'imaginer leur effective circulation. Les cartes imprimées par Tuttel sont, en toute probabilité, liées à son travail de constructeur d'instruments scientifiques : les cartes sur les instruments mathématiques auraient pu être conçues pour illustrer les instruments de son magasin, c'est-à-dire, comme un outil de publicité ; ainsi que les cartes arithmétiques semblent explicables en les mettant en relation avec le fait que Tuttel, comme plusieurs constructeurs d'instruments, donnaient aussi des leçons de mathématique. Les cartes géométriques par Moxon sont sans doute la source la plus difficile à être colloquée et interprétée : les références aux principes euclidiens de la géométrie et puis le focus sur la mécanique et les machines simples nous portent à penser que Moxon s'adressait aux artisans ou aux amateurs ; au même temps, la traduction de la lettre de Descartes met l'accent sur la nobilité et l'importance de la matière. Des recherches supplémentaires sont évidemment nécessaires.

3. Activités en rapport avec le projet de recherche

31st août t- 3rd septembre 2020

Playing with science. Science-themed board-games and card decks in Modern Age

Conférence de la Société Européenne d'Histoire de Science (ESHS Bologna 2020).

6-9 septembre 2021
Astronomy and card-games: between education and science popularization (XVIIIth-XIXth century)
SISFA - XLI National Congress of the Italian Society for the History of Physics and Astronomy.

15-17 octobre 2021
Giochi da tavolo e sapere scientifico. La produzione dei Wallis (1780-1830 ca)
Conférence jeunes chercheurs et jeunes chercheuses de la Société Italienne pour l'Histoire de Science (SISS - Storie di Scienza).

8 février 2022
Un "passatempo aritmetico": giochi di società e saperi scientifici nell'Inghilterra tra XVII e XIX secolo
Séminaire à l'Université de Trento, Département de Mathématique.

17 mars 2022
Jouer avec les sciences. Circulation des savoirs dans les jeux de société à l'époque Georgienne Séminaire IHMC Pour une histoire politique des sciences - Organisateurs : Hélène Blais, Jean-Luc Chappey, Maria-Pia Donato, Muriel Le Roux, Charles-Francois Mathis et Stéphane van Damme.

4. Activité en rapport avec le LabEx HaStec

24 Septembre 2020
Présentation du projet de recherche *Cartes à jouer et jeux de société au regard de l'histoire des savoirs à l'époque moderne (1750-1830)*.

Organisation du 9ème Séminaire des Jeunes Chercheurs du LaBex HaStec et rédaction des comptes rendus.

29 Avril 2021
Présentation *Quel savoir scientifique dans les jeux de société ? Une première analyse de la production de la famille Wallis.*
9ème Séminaire des Jeunes Chercheurs du LaBex HaStec.

29 Avril 2022
Présentation *Jouer avec les sciences : de l'Angleterre à la France (1770-1840)*
10ème Séminaire des Jeunes Chercheurs du LaBex HaStec.

5. Publications en rapport avec le projet de recherche

1. *An Astronomical Card Games: Contents, Circulation and Public*. Atti del XL Convegno annuale SISFA (Pisa: Pisa University Press). Annexe 1.

2. *When Goose taught arithmetic. Wallises' science-themed board-games in Georgian London*, envoyé le 2 septembre 2022 à *Centaurus - Journal of the European Society for the History of Science*; en révision. Voulez-vous trouver le reçu de réception et le texte intégral en annexe (Annexe 2).

3. *Playful Encounters. Science-themed card and board-games across the Channel (1790-1850 ca)*, envoyé le 6 septembre 2022 aux Archives Internationales d'Histoire des Sciences. Texte intégral en annexe (Annexe 3).

4. *Science-themed games and immersivity* (titre provisoire). Atti del Convegno SISS (Catania 30 Mai-1 Juin 2022). En préparation.

L'essai se portera sur les jeux des Wallis et le concept d'immersion : en effet, dans les jeux à thème scientifique que je viens d'analyser l'espace de la table à jouer est souvent dépassé et tout l'espace domestique des joueurs est engagé (par exemple, à travers l'indication de réaliser des expériences).

5. Contribution dans l'œuvre collective dédiée à Descartes et les images, *Cartesian Images. Picturing Natural Philosophy in the Early Modern Age*, dirigée par Mattia Mantovani et Davide Cellamare (Brill). En préparation.

L'essai, que j'écrirai avec prof. Claudio Fontanari (Université de Trento), sera dédié aux cartes de géométrie publié par Moxon à Londres en 1697. Les cartes représentent les figures géométriques des Eléments d'Euclide et les machines simples (le plan incliné, le coin, la vis, le levier, la roue et l'axe et la poulie).

6. Autres exposés, conférences et activité de recherche

Presentation *What a comet can make to yo*u, à la conference de la Société Européenne d'Histoire de Science (ESHS Bruxelles 2022), dans le symposium *Making legitimate science in tumultuous times: semantics, communication, and the public in late-Enlightenment France (1773-1811)*.

Co-rapporteure des thèses du master en Histoire des Mathématiques (rapporteur prof. Claudio Fontanari) :
Silvia Covolo, *L'Algebra di Rafael Bombelli tra manoscritto ed edizione a stampa* (AA 2021/2022).
Angelica Piselli, *La matematica ricreativa in Italia* (titre provisoire) (AA 2021/2022).

30 Mai 2021 Interviewée pour *Dialoghi virali*, programme du Museo Storico Trentino (hlmuseostorico.it). J'ai parlé des pandémies du point de vue historique.

7. Autres publications

8. Bibliographie

Pour une bibliographie complète et exhaustive, voulez-vous voir les trois articles en annexe.

9. Annexes

Annexe 1. **An Astronomical Card Games: Contents, Circulation and Public (SISFA Acts du colloque)**

Abstract: the present contribution will investigate a card game titled *The Elements of Astronomy and Geography*, created in 1795 by the abbot Paris and published in London by John Wallis. In 1807, the game was translated into French and circulated in a new, reworked edition. On the basis of meaningful, yet little, evidence, some hypotheses on the circulation and the audiences of the game will be outlined. The analysis is part of a wider research project, aimed at analysing a series of science-themed board games and card games, published between the XVIIIth and the XIXth century by the Wallises.

Keywords: card games; scientific knowledge; science popularization; astronomy; audiences; translation; circulation.

1. Scientific knowledge and games

a. *1.1. A history to be written*

For a long time, many outstanding scholars have been discussing the meanings, the history and the evolution of play and games within human culture (for instance, the groundbreaking works by Huizinga 1938; Caillois 1958). Within such a rich and long-standing theoretical framework, in the following decades an increasing number of studies has investigated the history of the games (e.g. Hargrave 1966; Goodfellow 2008; Levy 2017; Parlett 2018; Seville 2019) by focusing on their contents, their physical characteristics, their uses and circulation, thus connecting such research to the fields of cultural studies, material history and the history of education. These studies have brought to light a stunning richness of topics, contexts and social practices (for instance, Smoller 1986; Goodfellow 1998; Dove 2016; Norcia 2019). Nevertheless, to date no author has specifically investigated science-themed games, except for some papers analyzing a few, paradigmatic examples (Keene 2011; Seville 2016), and no attempt has been made to offer a systematic and exhaustive overview of these games. The present contribution is part of a wider research project aiming at studying the science-themed board games and card games conceived and published by the Wallises, a family of publishers active in London between the XVIIIth and the XIXth century.

b. *1.2. Science-themed games by the Wallis family*

It was John Wallis who opened the first shop[1] around 1775[2]; later on, his son Edward took over the family business[3]. Between the second half of the Eighteenth century and the first half of the Nineteenth, they sold to Londoners books and toys for children: it was a new, flourishing market (Plumb 1975; Denisoff 2008). Their shelves also offered board games and card games, mostly addressed to a juvenile audience. Many of these games had history or geography as their main theme, such as the card decks devoted to the history of France or England, and the board games centred on geographical tours (e.g. Wallis; Cooke 1796). Some others, however, dealt with scientific topics, which went from arithmetic to astronomy, from natural philosophy to zoology. One of the earliest examples is that of the board game *Arithmetical Pastime* (1798), intended to teach

[1] There were probably two, one in Ludgate Hill Street and one in Cornhill ("WALLIS, John", British Book Trade Index, URL: <http://bbti.bodleian.ox.ac.uk/details/?traderid=72631> [access date: 13/10/2021]).

[2] He soon became well-known for his dissected maps. Dissected maps were early examples of jig-saw puzzles, invented around the 1760s (Norgate 2007).

[3] "WALLIS, Edward", British Book Trade Index. URL: <http://bbti.bodleian.ox.ac.uk/details/?traderid=72611> [access date: 13/10/2021]. The other son, John jr., became the librarian of Royal Marine Library ("WALLIS, John [jr]", British Book Trade Index, Url <http://bbti.bodleian.ox.ac.uk/details/?traderid=72634> [access date: 13/10/2021]).

the “rudiments of arithmetic, under the idea of amusement”, translated from German. In 1804, it was the turn of *Science in Sport, or the Pleasures of Astronomy* (see Keene 2011), which interestingly saw the collaboration with Margaret Bryan, one of the most famous female authors of science popularization (Tailerach-Vielmas 2011, p. 4; Brück 2009, p. 15-19). One year later, *Science in sport, or, The pleasures of natural philosophy* (1805) was on the Wallis’s shelves and in 1813 *The naturalist: a new game, moral and instructive* finally came out. Edward proposed some re-editions of his father’s publications, likely the most successful ones, but he also introduced innovative subjects. His catalogue included, for instance, the *Wallis's elegant and instructive game exhibiting the wonders of nature in each quarter of the world* (1818), where nature is romantically described as marvellous and frightening at the same time, and the *Wallis's new game of genius* (1830 ca), which was, as specified by the subtitle, a “Compendium of inventions connected with the arts, sciences, and manufactures”.

Consistently with the changes typical of the epoch with regard to children’s education (Shefrin 1999; Talairach-Vielmas 2011), the Wallis’s games were intended to be educational games, so that the scientific knowledge was taught together with moral advice. Interestingly, the only game where this does not happen is the card game *The elements of astronomy and geography*, which also was the first science-themed game published by the Wallises.

2. *The Elements of astronomy and geography*: a card game

2.1. The two editions

In 1795, John Wallis published the card game titled *The elements of astronomy and geography: explained on 40 cards*. The author was the abbot Louis Michel Paris, a French teacher of geography and astronomy. We do not have any precise information to help us trace back the genealogy of their collaboration. However, we know that Paris, who was born in Argentan in 1740 and had been working there for a while, in 1792 left his hometown, forced by the tragic events which followed the French Revolution, and moved to London, where he remained until 1801 (Rabbe et al. 1834, p. 537). We may then hypothesize that, while in England, the abbot met Wallis and so the project of the card deck took shape. We cannot say whose, between the two, the original idea was. At the time, as we have seen above, Wallis had already published some board games and at least one card deck. Nevertheless, the *Elements of astronomy and geography* was the first science-themed game sold by Wallis, so that the topic may have been proposed by Paris, who then designed the contents.

The game consisted of 40 cards, “beautifully engraved and coloured”, as the title printed on the box ran: each card was illustrated on the front[4], while the correspondent caption was displayed on the back. As indicated by the rules, in order to get the point players had to properly describe the figures without looking at the written explanations.

The deck starts with the picture of an armillary sphere, simply defined as “a round body, encompassed by circles, lines, and points” (card I), while the second card shows the two hemispheres, with the Equator, the Tropics and the Artic and Antarctic Circles depicted. The caption says that “the Map of the World is a representation of the Earth on a plain surface” (card II). The following cards go back to the basic concepts of geometry, from straight and curved lines (card III) to circles (card IV), from circumference (card V) to its elements, such as the diameter (card VI), axis (card VII) and angles (card VIII). From card IX, notions about the Earth are given. First, our planet is described as “convex, or round like a ball”, then definitions of the Equator, Meridians, Longitude and Latitude, Horizon and further astronomical fundamental terms are given. Finally, the last cards are devoted to the Moon, the Eclipses, the winds and the atmosphere. The illustrations are simple and essential, easy to understand.

[4] The name of the illustrator is unknown. We do not know if it was the abbot Paris himself.

In 1807, a French edition appeared: titled *Jeu élémentaire d'astronomie et géographie*, the card deck was illustrated by the famous engraver Godard, in Alençon, and the text was printed by the Frères Brée in Falaise[5]. According to the few biographical notes available (see Lange 1833, p. 402), the contents were signed by Paris himself: since they are different from the English original edition, we may assume that the abbot had been modifying the game just before he died[6]. The changes between the two versions are worth outlining quickly. First, two cards were added, with volvelles depicted on them. Secondly, the descriptions provided in the French version are sometimes simply reformulated and made clearer (this is the case with the cards on the eclipses (Moon and Sun); some other times, the text turns out to be more complex and articulated than that offered by Wallis's publication. The first card, for instance, gives now a longer explanation of the armillary sphere, which is defined as a "machine" capable of representing the movements of celestial bodies. Similarly, on the XIIth card several details about the Equator are added and the concept of Latitude is introduced, whilst previously the card just said that "THE Equator divides the Globe into two equal parts; one north, and the other south; it is the measure of time". Again, on card XXV a historical account is added: speaking of the climatic zones, Paris recalls that Polibius had tried to introduce two torrid zones (instead of one), divided by the Equator, but "personne ne l'a suivi". A last example is given by card XXXIX, which in the English edition told players that "the wind is an agitation of the air, by which a particle is transported from one place to another"; the second edition, instead, gives a digression about the air. "L'air", it is specified, "est un fluide […] qui s'efforce toujours de garder ou de rétablir l'équilibre de toute ses parties": the wind occurs, writes Paris, when the balance is broken and needs to be restored.

All these modifications are likely attributable to the abbot's desire to improve the game before putting it on the French market; however, the hypothesis of a change of aspired audience cannot be completely discharged, as the following paragraph will clarify.

2.2. Circulation and audiences: some hypotheses

It is evident that it is extremely difficult to assess what circulation Paris's card game has had and what audiences were effectively reached; nevertheless, an attempt can be made.

At first glance, one may be inclined to hypothesize that the card deck was addressed to a juvenile audience, like the vast majority of Wallis's items, or even specifically to students, being the abbot Paris a teacher of astronomy and geography – he worked as a teacher in London too, in a school for French people (Lange 1833, p. 402). Moreover, the card X explicitly says: "The students who begin to study the Globes, cannot imagine how those who are opposite to them can stand on the surface". Mentioning "students" may suggest that they were the first intended public. However, if we look at the French translation, we notice that the term "students" is translated as "Ceux qui commencent l'étude du globe", that is "Those who start studying the globe": these, as it is clear, can be people who want to learn astronomy and geography, and not forcefully only students. So that, at least for the French edition, we can imagine a broader audience, especially since we do have some evidence moving in this direction.

A first clue is offered by the French newspapers that advertised Wallis's game. One comes from the famous and widespread *Le Moniteur*, that in August 1808 presented the card deck to its readers as "equally instructive and fun"[7]. We find no mention of an intended public made exclusively of students and neither of young people. A second clue comes the periodical *L'Epicurien Français*[8], which lists the card game among the

[5] Both the cities are placed in Normandy and close to Argentan, the hometown of the abbot Paris, where he had returned in 1801 and where he had died in 1806.

[6] Similarly, we know that he was reworking his *Introduction à l'étude de la geographie*, when he died (Lange 1833, p. 402).

[7] «Les connaisseurs sauront apprécier le mérite de ces cartes, également instructives et amusantes », *Le Moniteur*, 15 Août 1808, p. 896.

[8] *L'Epicurien Français*, Tome XI, Août 1808.

new books. After the same words[9] we had read on *Le Moniteur*, a further, meaningful paragraph is added here. It is in fact said that the cards designed by the abbot Paris will be "very useful for those who want to learn, with no trouble and at a low-cost, some very extensive notions about the two sciences in question"[10]. The choice of the term "personnes" seems to confirm that the game was described and perceived as a game suitable for a heterogenous audience.

A last record leads us to hypothesize that not only the expected, but also the effective players were not, or not only, young students. We in fact find the Wallis card game listed among the books of an anonymous French architect (Anonyme 1856), put on sale after his death. The owner being unknown, one may argue that the *Elements d'astronomie et geographie* were there because of some child from the architect's family. However, it must be noted that the game, in the catalogue of his library, is numbered together with the *Abregé d'Astronomie*, a compendium of astronomical notions, written in 1774 by the astronomer and populariser Jérôme Lalande (see Ampollini 2019). The *Abregé* was a popular treatise, conceived for "the great number of amateurs"[11]: we then can prudently hypothesize that the anonymous architect had both the card game and Lalande's work to acquire some notions of astronomy. That is, Paris's game in France did not exclusively circulate among students or young, but also among adults willing to learn.

Similarly, the additions introduced in this second edition can be explained with Paris's desire to enrich the information provided, being that the aspired players were not only children.

3. A brief conclusion

The aspect of the real circulation of this card game, −and, more in general, of all the science-themed card and board games− can give us important indications about its uses, cultural meanings or the contexts it has crossed. Not only. The issue also pertains–its and their place in historiography: to date, these games have in fact been analysed through the lens of the history of education (as in Keene, 2011). However, the possibility that they have been addressed not only to children or young students, but to a more heterogenous public, force us to consider the necessity of looking at them also in their relationship with the history of science popularization. This is a history, after all, that still needs to be enriched -both of objects and periods.

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[9] See note 7.

[10] «Elle seront très-utiles aux personnes qui voudront acquérir, sans peine et à peu de frais, des notions assez étendues sur les deux sciences qui en sont l'objet», *L'Epicurien Français*, Tome XI, Août 1808.

[11] «Le plus grand nombre des amateurs» (Lalande 1774, p. III).

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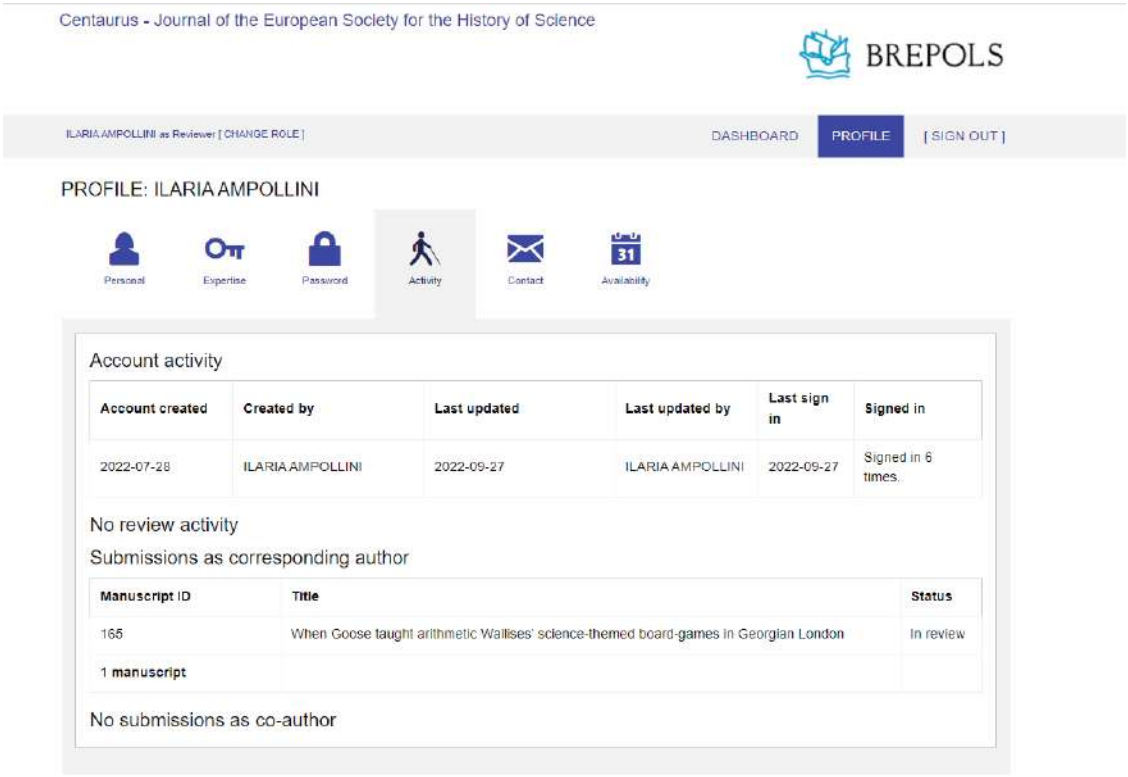
Annexe 2. **When Goose taught arithmetic**. **Wallises' science-themed board-games in Georgian London** (Envoyé à Centaurus).



i. Abstract

The second half of the Eighteenth century saw a veritable explosion of market-worthy items addressed to children and their families. That is particularly true for Britain, where during the Georgian Age towns and streets were populated by shops which offered books, toys, dolls, games and puzzles to young boys and girls. The Wallises' catalogue is a paradigmatic example: they sold textbooks as well as novels, dissected puzzles and board-games. The aim of this paper is to analyse their science-themed board-games, to date still understudied. To investigate the choice of topics, the ways they were translated into images, the explanations which were provided to players will allow us to outline how the Wallises elaborated and narrated scientific knowledge for their public. Specific characteristics often recurred: the references to the history of sciences (biographies or historical insights about inventions and discoveries); the representation of the "familiar" and "acceptable face" of science; the physical involvement of players and continuous trespassing beyond the board, up to the domestic space and outwards; finally, the interpenetration of science and moral. All these aspects suggest that not only these games are to be considered in their peculiar role as valuable tools for science education and popularization, but also that they had a specific place among other tools, namely, they are situated at the crossroads between printed texts and scientific instruments.

Keywords: Game of the Goose; science-themed games; scientific knowledge; science popularization; science education.

ii. Text

1. Introduction

As it is well known, the second half of the Eighteenth century saw a veritable explosion of market-worthy items addressed to children and their families. That is particularly true for Britain, where during the Georgian Age towns and streets were populated by shops whose shelves offered books, toys, dolls, games and puzzles to young boys and girls. If, on one hand, this transformation was the result of a period characterized by the fast growth of commercial activities, on the other hand, the new, developing sensitivity towards children played a key role in finally recognizing childhood as a proper, specific space in the world. In this space, both spare time and education were fundamental: in order to

play and learn, several objects were required to be bought and brought home, where they were used and enjoyed by children with their parents or other adults who took care of them – governesses, preceptors or servants.

This crucial turning point has been largely investigated for its implications within social, cultural, and economic, history[12]. Several scholars have analysed the contents of books for children, from the first novels[13] to textbooks (both used at school and at home), from toy-books[14] to the little cabinet collections[15]. Many have also focused on the materiality of these "little pretty" volumes when in the hands of boys and girls[16] and on the interactive and immersive fruition in which young readers were engaged thanks to a rich range of expedients. Materiality and interaction are obviously relevant in relation to toys and dolls too, and with a heterogenous corpus of objects going from dissected maps in order to learn geography[17] to Mogg's tiny sphere[18]. Finally, portable scientific instruments may be included in the list, considering that globes, microscopes and small telescopes were often bought by laymen to be kept at home[19].

Within this rich ensemble of existing studies, a relevant, although restricted amount deals with board and card games[20]. In the attempt to combine learning with amusement, as recommended by Edgeworths' works[21] and, prior to that, by Locke and Comenius, board and card games became the tool of choice to teach children (and sometimes adults[22]) while they were playing. Many of these games were employed to teach geography[23] and history[24], where the need of memorizing names, dates and notions made amusing oneself much more complicated. The requirement could be easily met thanks to the classic Game of Goose and similar path games presented in different versions, such as in the *Tour of Europe*[25] or the *Tour of England and Wales*[26], where players were supposed to move on the maps until they reached the victory square, usually London. Cards too were very useful, since they could be mixed and then rearranged to learn the right succession of Kings and Queens, wars and peace-treaties: after all, chronology was one of the most boring things for a child to learn and the system of rewards and merits could help children in memorizing information about historical events[27].

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[12] See the classic Plumb (1975) and the more recent volume edited by Denisoff (2008).

[13] The first book for children probably was the *Little pretty pocket book*, printed in London by John Newbery in 1744 and sold with a pincushion. See the detailed analysis in Klemann (2011).

[14] Several flap-books are described in Reid-Walsh (2017); in particular, see chapters 4 and 8.

[15] Like the one published by J. Wallis together with Elizabeth Newbery in 1797 and titled *The cabinet of knowledge opened and its secrets disclosed : being a set of questions and answers explanatory of morality, arts, sciences, &c. &c. : for the improvement of youth*. See also te Heesen (2002).

[16] Klemann (2011).

[17] For instance, Shefrin (1999a), Dove (2016). On these games' copyrights, see Alexander, Martinez (2020).

[18] Taylor (2009).

[19] As clearly demonstrated by texts like *The young gentleman and lady's astronomy, familiarly explained in ten dialogues between Neander and Eudosia to which is added the description and use of the globes and the armillary sphere*, authored by James Ferguson in 1768 or *An explanation and description of Mogg's celestial sphere* by Edward Mogg (1813). Valuable primary sources in this regard are offered by catalogues and books by the famous instrument-maker Benjamin Martin, who sold portable air-pumps, portable globes and mathematical instruments (Millburn, 1976). See also Taylor (2009, p. 362) and the less recent Turner (1987).

[20] Norcia (2019); Dove (2016); Goodfellow (1998).

[21] Peters (2017).

[22] Seville (2019, p. 70).

[23] Norcia (2019); Seville (2019, pp. 159-164 and pp. 177-183); Dove (2016); Seville (2008a); Shefrin (1999b).

[24] See Bryant Davies & Gribling (2020); Gribling (2020). See also the games listed in Seville (2019, pp. 84-91, for the French games about Revolution; pp. 173-176 for the English historical games.)

[25] Wallis (1794a).

[26] Wallis (1794b).

[27] Gribling (2020, p. 203).

Sciences as well were a common topic: examples ranged from natural philosophy to astronomy, from zoology and botany to arithmetic and geometry. Despite that, to date hardly any scholars have specifically focused on science-themed games[28]. One of the few exceptions is represented by M. Keene and her outstanding paper devoted to the board game *Science in Sport or the Pleasures of Astronomy*, which was published in London by John Wallis in 1804[29]. What is still lacking, however, is an overall view that takes into account a broader corpus of primary sources and tries to identify common features, peculiar aspects and transformations over time.

As it has been widely demonstrated, in fact, the Game of Goose and its counterparts are extremely valuable sources when exploring social and cultural contexts or practices, as well as the circulation and reception of shared knowledge[30]. Moreover, games like those conceived during the Georgian age and aimed at youth instruction provide a rich amount of information about the history of childhood and the history of educational practices and spaces of learning[31].

All this can be equally said for science-themed games, which, however, are charged with further connotations: they in fact offer us unique insights and a privileged lens to investigate the circulation, transmission and reception of modern sciences, their permeation in domestic contexts and the ways in which they were taught and communicated. Such a process prompts us to ask ourselves how scientific notions were chosen, transformed and adapted, how they were translated into images and eventually submitted to a list of playing rules.[32] The science-themed games from John and Edward Wallis' catalogue offer a good, although obviously partial, starting point to answer these questions: they provide us with a relevant range of visual and written narrative about scientific knowledge, going from astronomy to natural philosophy, passing through arithmetic, natural history and technological developments. The choice of men of science depicted and their biographical portraits or the themes and scientific instruments selected, as judged to fit with the games' purposes, offer us a great deal of information about how scientific subjects and objects were implemented into the games, how they were filtered, manipulated and represented, to what purpose and to what extent. Finally, since the Wallises' shop was open for seventy years, their catalogues help determine how the card and board games changed during these decades: such transformations, naturally fostered by commercial reasons and public tastes, also reveal a constantly evolving sensitivity towards scientific knowledge and its main actors[33].

2. The Wallises and their shop

Focusing on the Wallises and their science-themed games builds on the fact that, among the publishers and sellers of games who were active in London during the second half of the XVIIIth and the first

[28] A few paragraphs can be found in Seville (2019, pp. 183-185).

[29] Keene (2011); Seville (2016).

[30] As in Seville (2019, p. 333-350), where the history of Game of Goose is discussed in its relations with cultural history.

[31] See for instance Bryant Davies, Gribling (2020); Norcia (2019); Goodfellow (1998). Young Choi (2021, p.98) notes: "Critics have argued that games performed important cultural work in nineteenth-century Britain, that they promoted national ideals and more specifically, a respect for rules, a spirit of competition, and a sense of mastery over both natural and colonial worlds".

[32] The question here will concern the scientific knowledge that was transmitted in these spaces through the games, but it is worth to also recall those works dealing with science as produced and originated within familiar and private contexts: for instance, Opitz. et al. (2016).

[33] As it is obvious, also the different creators/authors of the games and the different audiences they aimed to reach influenced the choice of themes.

decades of the XIXth century, they were, in all likelihoods, the only ones to propose so many items linked to the transmission and the teaching of scientific knowledge.

If we look at coeval catalogues, we will only find two board games on British and foreign Animals printed in 1830 by the well-known William Darton and *The New Game of Multiplication Table*[34]. Other science-themed games, such as the board-game *Astronomical Recreations* and the deck of cards *The Multiplication Table in Rhyme* created by John Betts, went on the market only in the 1850s[35], years after John Wallis' son, Edward, had left the marketplace[36]. Other sellers, who also published, like the Wallises, dissected maps and geographical or historical board games, never came to publish science-themed games. Not only in London, but both inside and outside Britain, we are unable to find that many examples of science-themed board games or playing cards during the decades of the Wallises' activity[37].

John Wallis opened his first shop[38] probably around the 1770s and soon became a much-appreciated maps publisher[39]. His store, located in Ludgate Street under the name of *Map Warehouse*, offered a pocket map of London (1787)[40], an Atlas of France (1794)[41], the map of the United States of America[42], and a military map of Spain and Portugal (1810 ca). Soon, John enriched his catalogue with dissected maps, that is, early examples of jigsaw puzzles, which had first appeared around the 1760s[43]: this means, indeed, that he must be among the first publishers[44] to join this new and original editorial venture. The *New Map of Ireland* (1785)[45], the *New and correct map of the post roads of England and Wales* (Wallis: London, 1798) or the *New Map of the World* (1800) were "peculiarly adapted for Youth learning Geography", as Edward Wallis would point out in his catalogue in 1819: to achieve the purpose, they showed "distinctly the Boundaries, principal Places, Rivers" and avoided any "crowded and confused appearance" [46]. They were available in different sizes and prices and, most importantly, they were up to date: in 1819, for instance, a Map of Europe "engraved according to the New Divisions, as settled by the Congress at Vienna" was introduced[47]. The dissected maps were not the only items which parents could find on Wallis' shelves for their child: as the same catalogue said, "A variety of Useful Publications for The Improvement of Youth" were "constantly on sale". Books, first of all, many of which intended for the education of their little readers, and board-games.

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[34] Carvalho (1830 ca).

[35] Another science-themed game published in the fifties was titled *Why, What, & Because: or, The Road to the Temple of Knowledge* (Sallis, 1850 ca.). The joint booklet contained questions, many of which about scientific topics (for instance light, oxygen, thermometers etcetera…), to which players had to correctly answer to advance.

[36] See the list in Whitehouse (1951, pp. 94-102). The last items were probably published by Edward Wallis around 1846. He ceased the activity in 1847, when Passmore took over his stock, as recalled, for instance, by Norcia (2019, p. 2 and p. 184, n.3).

[37] Worth remembering are science-themed board-games printed in Paris by Basset, listed in Girard & Quétel (1982, p. 188).

[38] On Wallis' activity, see the studies by Norcia (2019); Rovee (2015); Keene (2011).

[39] Gribling (2020, p. 201): "In contrast, John Wallis began as a bookseller for adults, but saw the growing market for juvenile wares and moved into children's publishing in the 1780s, where he became known for his ability to create new games or to adapt those of competitors to make them more appealing to child audiences". Gribling refers to Hannas (1972, pp. 30–35).

[40] Wallis et al. (1787).

[41] Wallis et al. (1794).

[42] Wallis (1814).

[43] Norgate (2007).

[44] John Spilsbury is credited for being the inventor of the first jigsaw puzzle in 1767. However, Shefrin (1999b) has identified M.me de Beaumont, who was living in London between 1748-1762, as the first to have created wooden dissected maps.

[45] Wallis (1785).

[46] Slater (1819, p. [95])

[47] Ivi, P. 94.

A quick overview[48] is sufficient to note that geographical board-games found – as could be expected, John Wallis being firstly a maps and dissected maps publisher – quite good space in the catalogue, such as the tours in Europe or those in England and Wales[49], both published in 1794, or the tour around the world[50], which made its way on the shelves two years later. But history too was well represented. A wonderful example is that of the *Historical cards exhibiting the history of England*[51], consisting in a deck of 36 cards showing the sovereigns of England. As a confirmation to the good response in terms of audiences to this kind of game, Wallis also published a card deck devoted to the history of France[52], chronological tables of the history of England[53], proposed in the guise of a puzzle to be recomposed, and a sample of chronological tables on Roman history, "from the foundation of the City to the Augustan age"[54]. Edward, his son, would later reissue some of the items sold by his father, but he also proposed new subjects: for instance, a board-game dedicated to the "wonders of art"[55], the famous *Game of the Star-Spangled Banner or emigrants to the United States*[56] (one of the first maps of the United States, containing a clear propaganda against slavery) and the pair *Wallis's locomotive game, of railway adventures*[57] and *Wallis's new railway game*[58], from which the intention to offer his customers games strongly linked to current events and topics is evident, be they up-to-date information about the New World or a rhetorical celebration of trains and recently built railways.

What about science-themed games, then? We do not have any clear evidence about how and why John Wallis decided to propose to his public science-themed games; nevertheless, we can take into consideration some significant elements which can help retrace the beginning of this editorial initiative.

Wallis published his first science-themed game in 1795. Titled *The elements of astronomy and geography*[59], it consisted of a deck of cards and the author was Louis Michel Paris (Argentan, 1740-1806), a French abbot and professor of Latin, Astronomy and Geography. During the French revolution, Paris was forced to leave his hometown[60] and reached London: he would remain here for nine years, during which he taught in a French Catholic school funded by the Abbot Carron[61] for children of refugees. Since we know that board-games and playing cards had been used for decades to teach students, and that France had a very long tradition[62], we may hypothesize that Paris got in touch with Wallis and that this first game arrived on his shelves thanks to Abbot's idea.

More in general, we know for sure that at the time the rich and evolving market addressed to children was comprised of several books of science popularization, which were very much appreciated by the

[48] Refer also to Rovee (2015); Keene (2011).
[49] Wallis (1794c). On the *Tour of Europe*, first created in 1768, see Alexander and Martinez (2020).
[50] Wallis et al. (1796).
[51] Wallis [between 1775-1818].
[52] Wallis [between 1789-1792].
[53] Wallis [end of XVIIIth century].
[54] Wallis, Newbery (1789).
[55] Wallis [1820 ca].
[56] Wallis [1830 ca].
[57] Wallis [1838 ca].
[58] Wallis [1844 ca].
[59] Some years later, the game was translated into French and published by the Frères Brée (Falaise, 1807).
[60] Rabbe & al. (1836, p. 537).
[61] Guy-Toussaint-Julien Carron (1760–1821). See *Vie de l'abbé Carron* (1866).
[62] A very representative example is given by the *Jeu des Fortifications*, introduced already in the XVIIth century probably by Jesuits. See Girard & Quétel (1982, p. 51). Jacobs (2012, p. 2) underlines the role played by Jesuits in exalting games as educational aids. See Van Damme (2019, p. 181), about the heraldic games proposed by Jesuits. Also note that in his book *Jesuits and Fortifications*, De Lucca devotes an entire chapter to Jesuits teaching the art of fortifications (2021, pp. 69-184) - but he does not mention any game.

potential buyers[63]. So that Wallis, often described as a far-sighted entrepreneur[64], must have foreseen a new, important possibility for his shop. And if other attempts, like the game about music[65], had no continuation, science-themed games became instead a significant and representative part of his catalogue. Topics ranged from astronomy to arithmetic, from natural philosophy to natural history. When John Wallis died, in 1818, his son Edward took over: he re-issued some games from his father's catalogue, such as *An Arithmetical Pastime*[66], the *Pleasures of Astronomy*[67] and the *Pleasures of Natural Philosophy*[68], thus suggesting that they had obtained a certain success among the public; but he also published some new, original board games. Times were changing, and, as noted by Secord[69], that meant speaking to different children and different families[70]: new proposals, indeed, resulted in being receptacles of emerging issues and new sensitivities.

In the next paragraphs, we are going to analyse the contents of these board-games, trying to assess what images of science they transmitted, how they did so and how these images evolved over time.

3. Images of science at play

While analysing Wallises' science-themed board games, we have to keep in mind that the creators, authors and engravers are unfortunately (even if not surprisingly) to date nameless: we do not know, in fact, if John and Edward conceived the games, which were then illustrated by several engravers, or if the contents were also conceived and drafted by someone else[71]. The card-game signed by the Abbot Paris represents an exception. Another science-themed game, titled *The Pleasures of Astronomy* and published in 1805, was presented as "revised and approved by Mrs. Bryan Blackheath", whose name was used as a guarantee of the correctness and reliability of the contents. Mrs. Bryan was in fact one of the most famous female authors of works of science popularization[72]: her book *A Compendious System of Astronomy*, printed in 1797, was very much appreciated[73]. The expression "revised and approved" lead us to think that the game may have been created by one of the Wallises (in this case, John), who asked for Mrs. Bryan's help only in a later time. For the other games we are going to focus on, no details are given. It is nevertheless obvious that themes and iconography of the games were chosen, or at least supervised, by the Wallises and influenced not only by their need and desire to publish commercially successful items (that is, close to Georgian families' tastes), but also by a certain sensitivity and awareness about what a good science education should be made of.

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[63] Tailerach-Vielmas (2011, pp. 6-21). Consider for instance the catalogue of John Newbery (1713-1767), who published the successful *Newtonian System of Philosophy, by Tom Telescope*, around 1760 (Secord, 2011). His niece, Elizabeth, was also a collaborator of John Wallis.

[64] Gribling (2020, p. 201).

[65] Wallis (1791).

[66] Wallis (1798).

[67] Wallis E. (1815).

[68] Wallis E. [1830 ca].

[69] Secord (2011, p. 54).

[70] See also Young Choi (2021, p.98): "But through their changing themes and designs, early nineteenth-century children's board games trace another history, one of epistemological transformation in popular understandings of chance and contingency".

[71] We cannot discharge the hypothesis that the original ideas for the games came from the Wallises themselves, who then relied on engravers to create them. To date, there are no clues. Whilst the rules and the contents are often similar from one game to another, figures are generally different: this leads us to assume that, in all likelihood, the illustrators changed.

[72] Tailerach-Vielmas (2011, p. 4); Brück (2009, pp. 15-19).

[73] In precisely 1799, a second edition came out and among the subscribers were outstanding astronomers and men of science. She also signed a book on Natural Philosophy. Saridakis (2012); Brück (2009, p. 15).

3.1 The past and present face of science

Similar to many others (although not all[74]), the Wallises' science themed board-games were ~~a~~ quite an expensive good that few families could buy: their price, mostly ranging from 8 to 10 shillings, was not easily affordable. No surprise then that they were often given from parents as precious Christmas presents, as testified, for instance, by the inscriptions, dated 1820, found on a copy of *An Arithmetical Pastime*[75]. The board-games came out folded in boxes beautifully illustrated, accompanied by markers, counters and by the booklet of instructions–when not printed directly on the board. The young players did not roll the dice: their link with gambling suggested they should not enter the homes, because of the risk of moral corruption that would derive from that. It was thus clear that these games were educational games, which would never introduce children to games of chance or betting. For this reason, one or two teetotum, rather than dice, were supposed to be used, even if only rarely were they sold with the game. Rules were pretty much similar to the Game of Goose's, whose structure and layout were borrowed by these board-games and then modified according to different topics[76]. Players had to spin the teetotum and then move their counters on the board: depending on where they stopped, should they have to go backwards or forwards, stay for one or more turns or even start the game again. However, differently from the classic Game of Goose, the race was not only conditioned by mere chance: since young children of both sexes were supposed to acquire new knowledge through these games, they had to prove to have learnt the provided notions in order to advance and win. *Arithmetical Pastime*'s instructions, for instance, listed ten equivalence tables which had to be memorized and repeated whenever one arrived on that particular square. Square 7 asked to repeat the "Pence Table", square 85 the "Time Table" and square 28 the "Wine Table": with a wrong answer, the player had to stop some turns or go backwards[77]. In the board game *The Pleasures of astrono*my[78], one had to explain how the telescope, the celestial and the terrestrial globes worked; otherwise they had to skip two turns[79]. The later *Game of Genius*[80], instead, required players to read the description of a square aloud, once they arrived there; but if the description had already been read, then they had to repeat it, thus demonstrating they had listened to and learnt it previously[81]. Far from being improvised, indications like these fully reflected some of the most popular ideas of the time about juvenile

[74] As said by Seville (2008b, p. 2001): "Although the game was regarded as a suitable diversion for a Dauphin of France, the game had also a popular following and was regularly played for gambling stakes by men in taverns". For the French market, see Girard & Quétel (1982, pp. 15-17).

[75] "William Harrington the gift of his Father and Mother for Christmas Day 1820". The inscription is on the sample preserved at Cotsen Children's Library (Princeton University Library), Special Collection 27412 Board Games / Box 1. We also know that, for instance, the game *Pleasures of Natural Philosophy* was printed on the 17th of December 1805, as written on the board: this leads us to think that Wallis knew he could make the most by selling these items during the Christmas period. Finally, it must be recalled that even books for reading exercises were often given as presents from parents, as said by Grenby (2009, p. 194).

[76] One of the last board games printed by Edward in 1844, *The New Game of Wonderers in the Wilderness*, is an exception: the ordered and pre-determined path of the Game of Goose gave way to a coexistence of different, possible paths (in Young Choi, 2021, p. 106).

[77] The equivalence tables were: Table of Time, Pounds Table, Shillings Table, Pence Table, Numeration Table, Long Measure Table, Dry Measure Table, Wine Measure Table, Avoirdupois Wight Table, Ale Measure Table.

[78] Wallis (1804).

[79] Wallis (1805, pp. 5-8).

[80] Wallis [1830 ca].

[81] Wallis ([1830 ca.], p. 1).

education: the importance of memorizing[82], at first; but also, the common habit to read aloud in families[83].

Being that the main aim of these games was to instruct children, scientific contents were both carefully selected and up-to-date, which led to a transformation in the topics chosen and the way they were presented. In the *Structure of the Earth*, a Q&A card game published around 1830[84], original topics, which had never been seen in previous board-games, were proposed. Questions were all about geology and chemistry, thus demonstrating the pivotal role that these two disciplines had been acquiring since the end of the Eighteenth century and that were now playing outside of the learned circuits too[85].

[INSERT FIGURE *n 1*]

A similar trend can be noted in the increasing attention given to technological advancement: the more we come into the XIXth century, the more the accent on inventions becomes stronger. The *Game of Genius* is exemplary in this sense. The title itself underlines the importance given to ideas and creativity leading to innovation: descriptions contained in the booklet of instructions exalted men's capability, in past and present, of developing useful machines, thus producing tangible consequences in the fields of arts (for example, with lithographic printing or engraving), of transport and commerce (the steam-vessels and the mariners compass), of communication (the telegraph or the mail-coach), of everyday life (the gas-lamp or glass-blowing) and, finally, of scientific knowledge itself (the telescope and the microscope were naturally mentioned)[86]. Even more meaningful was the last square, placed at the centre of the board, which depicted "the most striking inventions of modern genius". These inventions included "a manufactory worked by steam", "a steam-vessel" which pursued "its rapid course" and a train "of those wonderful locomotive engines" passing along a "chain-bridge", capable of transporting "the most enormous burdens at the almost incredible speed of thirty miles per hour"[87]. The celebration of the Industrial Revolution, of the application of science to industry and of the English genius which had made them possible was accomplished, although it would be even stronger two decades later, in the *Circle of Knowledge*[88].

It must be noted that insights on the inventions also looked at their recent or oldest history: such historical perspective was common to the majority of the Wallises' science-themed board-games and was often used to explore the contents of the various scientific dominions. Declinations were multiple. Characters who gave fundamental contribution to the history of a discipline were portrayed and mentioned. Above all, Newton, "our Great Philosopher"[89], the illustrious Englishman who "proved the truth of the Copernican, or Solar system, by his wonderful discoveries and calculations"[90]. But other

[82] As recalled, among the others, by Gribling (2020, p. 195).

[83] For instance, see Grenby (2016, p. 188).

[84] The only sample I was able to identify is the one listed at https://www.gamesboard.org.uk/cgi-pub/gardpub.cgi?table=examples&pk=14768&command=view, from the Ballam Collection in John Johnson Collection at the Bodleian Library (Oxford).

[85] In the same years, several educational books about geology were published in London, as recalled by O'Connor (2007, p. 234-236).

[86] Wallis [1830 ca.].

[87] Wallis ([1830 ca.], p. 12). Steam was also celebrated in Dutch games, as noted by Seville (2019, p. 256).

[88] Wallis ([1848 ca.]).

[89] Wallis (1805, p. 14).

[90] Wallis (1804, p. 16).

names were taught to children too: Tycho Brahe, Copernicus and Tolomeus for Astronomy[91]; Boyle, Bacon, Descartes and Franklin for Natural Philosophy[92]. Historical digressions and details about their inventors were offered while describing the scientific instruments: the construction of the first telescope was attributed to the Dutch Zacharias Janssen (1580-1638)[93], whilst the Dutch Cornelis Drebbel (1572-1633) was said to have created the first microscope in 1621[94]. Remarkable discoveries were recalled, like the detection of Planet Uranus by William Herschel in 1718[95], and salient experiments or events were also attentively described, such as the first flight of the hot air balloon, performed "before the late king of France, at Versailles" with a sheep, a cock and a duck on board[96] or the famous experience of the "electric fluid" conducted by Benjamin Franklin with a paper kite[97]. When illustrating the air-pump, a long digression explained that the first historical turning point was represented by the work by Otto von Guericke and his "curious experiments" in 1654[98].

The choice of relying on historical accounts is quite understandable: first, it allowed to make scientific notions more enjoyable for players, by outlining them within the frame of a fascinating, curious story; second, it enhanced the memorization of dates and events, in accordance with the educational theories of the time[99]; and third, it was thus self-evident that only true and accurate facts were taught. This last element was fundamental, since it reflected the common and widely shared conviction that sciences had to be taught and popularized through facts, and not fancy. A sharp distinction between fact and fancy clearly emerged in *The Pleasures of Astronomy*, where the "Man in the Moon", in square 15, was defined as a "ridiculous idea of some ignorant people" who believed that there was "a Man in the Moon with a Dog, and a Bundle of Wood, who causes the different appearances of it by eating it away"[100]. No place for imagination; science had to be enough[101]. Besides that, the condemnation of that "ridiculous idea" can be also seen as the attempt to trace a line between what was scientific and what was not.

Showing an increasing awareness of what in effect was an epistemological question, in one of the latest games, the *Circle of Knowledge*, the line became sharper than ever and, interestingly, a historical perspective was used to explain how the line had been traced throughout the centuries. A first example comes from the Magic Lantern: dedicated to Optics, the square illustrated how a "combination of magnifying glasses" produced an image "of an immense size" on a wall. Then, one could read that if "in ancient times they were used to deceiving the ignorant", "science had abolished its superstitious use". In the light of this change, it was argued that they should be called "optical lanterns", being the term magic "founded wholly in untruth"[102]. In a celebrative, positivistic historical narration, science was said to have beaten superstition and magic, so that what was not scientific was now scientifically explicable. Even more representative is the example offered by the squares on

[91] Curiously, Galileo is not mentioned. The Italian astronomer is only recalled in the board-game *The pleasures of natural philosophy*, where the anecdote of "Galileo and the gardener of Florence" was told (Wallis, 1805, p. 10). However, the anecdote is about air pressure; Galilei's astronomical discoveries are not listed anywhere.
[92] Wallis (1805).
[93] Wallis, ([1848 ca.], p. 3).
[94] Wallis, ([1848 ca.], p. 8).
[95] Wallis (1804, p. 4).
[96] Wallis (1805, p. 7).
[97] Wallis (1805, p. 8).
[98] Wallis (1805, p. 11).
[99] Among others, see Klemann (2011); Hilton & Shefrin (2016); Peters (2017).
[100] Wallis (1804, p. 8).
[101] Regarding this aspect, see the illuminating work by Keene (2015), *Science in Wonderland*. See also O'Connor (2007).
[102] Wallis ([after 1847], p. 13).

Chemistry, which referred to the passage from Alchemy to Chemistry more than once. Square 23 pointed out that the very popular "Lecturers on Chemistry" of the time were "unlike the old Alchemist, as they develop to their audience the results of their experience by numerous beautiful experiments"[103], thus assigning to the dissemination of scientific knowledge a central role in defining what science was. Square 7 instead called Alchemists "a mysterious race of philosophers" who studied to convert "metal into gold". Nevertheless, these fruitless attempts, made by Alchemists who were "shut up as it were a prison", had led to present "great discoveries in chemistry", which were "the result of their toil"[104]. So that history was also a powerful tool to celebrate achievements of contemporary science.

3.2. The familiar face of science

Despite the changes along the decades of the Wallises' activity, what was described, portrayed and communicated to children constantly was, as J. Secord calls it, the "acceptable face of science". This is true since the decision to substitute, in the English version of the *Nouveau Jeu de la Vie Humaine*, Newton to Voltaire: if in the French, original edition, the victory square of the Immortal Man depicted the irreverent and brilliant philosopher, in John Wallis' edition Newton was to be represented. So that a relationship between immortality and scientific knowledge was tacitly asserted: science, and namely mechanics and Newtonian mathematized physics, gave access to a never-ending memory. Celestial mathematics[105], applied to the study of the Cosmos, elevated the spirit and consigned the soul to eternity: a life dedicated to science resulted in being a desirable one. Newton, however, also represented the value of a moral life[106]: so that it was moral, together with natural philosophy, to effectively ensure immortality.

The strong link between science and morality would be reaffirmed in several of the Wallises' board-games, as we will see in detail in the next paragraph. What is important here is that such an "acceptable face" can be repeatedly found; besides, it merges with another peculiar trait, that of "familiarity".

Science in the Wallises' board-games was familiar in the sense that M. Keene has given to the term, that is, science was mostly taught from objects with which children and their parents were familiar[107]. Instruments like telescopes, microscopes or the celestial and terrestrial globes, cited and displayed both on early board games, such as *The Pleasures of Astronomy*[108] and on later ones, like *The New Game of Genius* (1830 ca), were often available at gentlemen's homes, also thanks to the habit of selling portable versions of such objects[109]. Given the social background of families who could buy these board-games, it is not hazardous to imagine that at least some of them owned these instruments, which therefore were not unknown to children either. Not to mention magic lanterns and phantasmagoria, which were ~~a~~ very much appreciated and popular items, one could easily find in

[103] Wallis ([after 1847], p. 8-9).
[104] Wallis ([after 1847], p. 4).
[105] Biagioli (1989, p. 53).
[106] Secord (2011, p. 35). See the definitions of the "Godly Naturalist" and the "Moral Philosopher" proposed by SHAPIN (2003, pp. 162-167).
[107] Keene (2014). On the role of "familiar format", see also Peters (2017) and Cohen (2016).
[108] Wallis (1804).
[109] Like the ones constructed and sold by Benjamin Martin. See Millburn (1976).

shops. Finally, attractions like the camera obscura, the orrery and the hot-air balloon, even if not physically available at home, were all very well known[110], certainly to parents before children, and they perfectly embodied the idea of science in public together with that of the spectacle of science. In *The New Game of Genius*, the vertical orrery displayed in front of numerous spectators, at square 3, and the flight of the hot-air balloon admired by a crowd of people of square 17 convey a vivid impression of that[111].

[INSERT FIGURE *n 2*]

The experiments described or proposed to players also required the use of small, common objects easy to obtain[112]. In *The Pleasures of Natural Philosophy*, players, who arrived at square 27, could learn something about electricity, defined as "that property of some substances, as Amber, Glass, Sealing wax, &c, whereby they attract, or repel, all kinds of light bodies"[113]. Then they were told to "stay one turn and make the experiment": "Rub a piece of sealing wax on woollen cloth, and hold it near a small feather, or a piece of thin paper, and you will perceive the feather, or paper, attracted by the wax, which attraction is one instance of the nature of Electricity". No mentions to spectacular electrical experiments were to be found there; on the contrary, a very simple experiment was taught that everyone could reproduce. The same can be said of square 26, which explained that the same colours produced by the prism can be easily seen "also in the rainbow and on the surfaces of bladders of water and soap"[114]. And again, square 21 instructed players about the principles which made it possible to "descend beneath the water" with a diving bell by proposing an experiment with a drinking glass: "If you invert a glass rummer which is quite dry, in a bowl of water, and press it down as steadily as possible, you will find that the inside of the rummer will not be wet, because the pressure of the Air within, keeps the water from making it rise"[115].

Going beyond Keene's definition, and as already mentioned, the element of a "familiar science" met that of an "acceptable" one: the science of the Wallises' board-games had to be suitable for domestic spaces and private learning; and hence it had to be curious but innocuous, engaging but not disturbing. This aspect is clearly detectable in the *Pleasures of Natural Philosophy*, when air-pump functioning was explained and experiments which could be made with it were illustrated, nothing was said about the famous and popular experiments employing animals[116]. On the contrary, it was stated that the most frequent experiment was that of the feather and the guinea, which were shown to fall together when

[110] As also recalled by Keene (2014, p. 59).

[111] The experience of camera obscura was extensively transmitted through the tradition of rational recreations since the very first decades of XVIIth century (Heeffer, 2004, p. 32) and quite common, since early modern times, in cabinets of experimental philosophy (Bennett & Talas, 2013, p. 54 and p. 180). Hot-air balloons, as it is well known, were protagonists of events attended by large crowds, as shown, for the English context, by Keen (2006); but see also Lynn (2006, p. 123-147). Orreries too were often used for public lectures, as it was pictured by Wright of Derby. The orrery depicted in Wallis' board game is in all evidence Walker's *Eidouranion*, a large transparent orrery, which permitted theatrical performances to be given (Golinski, 2017).

[112] This is one of the characteristics of familiar science as defined by Keene (2014): a science taught about everyday life and objects and experienced through materials within everyone's reach.

[113] Wallis (1805, p. 15).

[114] Wallis (1805, p. 14).

[115] Wallis (1805, p. 12). Such experiments and observations were all at players' hand, allowing them to learn while being amused, as recommended by Maria Edgeworth and Richard Lovell Edgeworth, in their famous manual *Practical Education* (1798), which basically re-elaborated Comenius and Locke's theories. See Klemann (2011, pp. 226-229).

[116] The work by Wright of Debry is once again deeply meaningful in this regard: the two girls cry while looking at the experiment with the air pump and a birdy. See Johnson (2016).

in the void. After all, love and respect for animals were repeatedly taught in the Wallises' board-games[117].

The fact that, along the game path, children were encouraged to use familiar objects to personally practice testing the scientific notions they were supposed to acquire gave an important element of materiality to the learning process. To observe, to touch, to manipulate, to make attempts were considered essential parts of a good, solid education, as proven by all the interactive items–dissected maps and globes, flap books, etcetera one could find on the market[118]. The search for interactivity thereby led to the creation of board games which went beyond the board's scope, and invested all the domestic environment. Players too were not only called to move the pyramids from one square to another or handle the teetotum; they and their senses were completely involved in the activity of playing and learning. This engaging immersion is also evident in the instructions which asked the young boys and girls to "meditate upon" a certain subject[119] or to learn the meaning of words or expressions which had not been explained in the booklet[120]. The games spread to the space around, thus producing tangible effects and overcoming the game's material boundaries.

Such trespassing, which testified the aim of these educational games to produce effects on the players' everyday life, also implied the attempt to give lessons about good and bad behaviour, as we are going to see in the next paragraph.

3.3. The moral face of science

Since the very first science-themed games published by John and Edward Wallis, the role assigned to morality and good behaviour, as it often was for educational items addressed to children in Georgian London[121], was prominent. Christian values permeated the game paths, although no explicit mention was made to religious beliefs. It seems that Maria Edgeworth and her father was the model to follow. Children who played were expected to be "industrious, obedient, constantly respectful . . . never too spoilt, occasionally indulged as a reward for virtue"[122].

In a game like *The Pleasures of Astronomy*, only one square was devoted to the scope: square 20 represented the Idle Boy, who was depicted while blowing bladders (soap bubbles), completely unaware of the principles which made them possible. As the verses said: "This silly Youth, with ignorant surprize,/sees the gay bubbles in the sun beams rise;/abut surely better were employed his care,/to comprehend th'elastic power of the air"[123]. Blaming this attitude showed children the importance of studying. In other games, however, moral teaching was not confined to a single square; it was, on the contrary, an essential part, as in *An Arithmetical Pastime*[124].

[INSERT FIGURE *n 3*]

[117] As in *The naturalist: a new game, moral and instructive* (1813), but also in *An arithmetical pastime: intended to infuse the rudiments of arithmetic, under the idea of amusement* (1798).

[118] Reid-Walsh (2017); Klemann (2011); Shefrin (2009); Taylor (2009); te Heesen (2002); Shefrin (1999b).

[119] "Stay here one turn to meditate upon this subject", Wallis (1804, p. 10).

[120] "Stay one turn to learn what is the meaning of SPECIFIC GRAVITY", in Wallis (1804, p. 4).

[121] Plumb (1975, p. 80); Klemann (2011); Reid-Walsh (2017, in particular pp. 107-111).

[122] Plumb (1975, p. 80).

[123] Wallis (1805, p. 11).

[124] Wallis (1798).

Translated in 1798 from a previous German version[125], this board-game was dedicated to the teaching of the "rudiments of arithmetic, under the idea of amusement". However, players were not only expected to learn the four operations and the equivalence tables, but also to assimilate moral precepts. Illustrated squares, representing colourful natural scenes −birdies, flowers, fliers, landscapes−, referred to rhymed verses which outlined good and bad behaviour and consequently indicated the move to make. Square 13, for instance, reminded the player that not "all that's called happiness ends in true joy" and exactly like the "rose-buds of pleasure", it "oft cover[s] a trap". Other squares suggested following the example of virtuous animals, like the industrious bee at square 53, to be admired for its unceasing work, or the faithful dog, on square 17. The last square, numbered 100, went further, as it told the player how to behave in case of a win: crowned with "the laurel of victory", he would not have to be "insulting" and neither to "triumph with spite". He also had to remember that he "might have been loser" and that maybe he will be next time. So that the board-game aimed at producing some concrete, immediately visible effects on the players' conduct, by influencing their reactions in front of an eventual victory.

Interestingly, some other verses made the game moves dependent on the players' behaviour in their every-day life. At number 9, for instance, children were asked if they had already done their business; if the answer was yes, one could take a piece of plum-cake and spin again; if not, he or she had to stop one turn[126]. Similarly, square 26 said: "The lark rises early to sip the sweet dew,/Lay your band on your heart – do you rise early too?/ If you do, take a dozen, I love to reward". Square 81 outlined the importance of truth, that has to "pervade" every word, "clear as the sun": "if from the truth you've erred to-day", was said to the player, he had to stop for three turns; but if not, he did not need to[127]. In this way, the pre-determined path of the Game of Goose opened up to alternative routes closely conditioned by the players' will of telling the truth about their behaviour: they in fact had to confess not to have said the truth or not to have done their business in front of their friends or siblings or even parents with whom they were playing with.

The use of animals and animal habits for moral teachings was obviously nothing but new[128] and it was bound to appear again in another board-game, titled *The naturalist: a new game, moral and instructive*[129], published by John Wallis in 1813. All the squares depicted animals – mammals, insects, birds or reptiles –, which were then (scientifically) described in the booklet; however, each description ended with a moral teaching, to which the moves to take were also subordinated. So, for instance, on the first square, one would find the fox. The caption said that foxes dig "an habitation in the earth" and that at night time they "attack poultry, rabbits, and other defenceless animals". The player had then to stop for three turns and "take a few lessons in honesty"[130]. Nature was another perfect tool to show children how to behave properly: in *Wallis's elegant and instructive game exhibiting the wonders of nature in each quarter of the world*[131], re-issued in 1830 by Edward, sublime landscapes and fearful natural phenomena were accurately described in the joined booklet. Volcanoes, waterfalls waterspouts

[125] The edition listed on the online catalogues was printed in Nuremberg in 1795 by Georg Dein. The sample lacks instructions and only the game board seems to be left.

[126] Square 9: "Was all your business done to day,/ In time, and well, not spoilt by play?/Then take your plumb-cake and a spin;/If not, stop here a turn and grin"

[127] Square 81: "When the sun shines, the dial's shade/ Shews the true time, nor ever lies./ Let truth your every word pervade,/Clear as the sun, and you'll be wise./ If from the truth you've err'd to day,/Stop thrice – if not, you need not stay."

[128] It is not necessary to recall the names, among the others, of Aesop and La Fontaine. (see also Jacobs, 2012, p. 10)

[129] Wallis (1813).

[130] Wallis (1815).

[131] Wallis (1818). From now on, *Wonders of nature*.

and earthquakes demonstrated to players that men cannot dominate nature, which has to be admired and dreaded at the same time.

However, the height of the interpenetration between moral teaching and scientific contents was reached in the late *New Game of Genius*, which, as we have already said, represented a wide series of scientific instruments and of the latest technical advancements in the fields of communication, transports, but also industry and manufacturing. The booklet of rules, as usual, gave detailed information about the contexts and people behind each invention. But the scientific and technological progress was far from being depicted as neutral or positive *tout-court*: on the contrary, inventions were clearly divided into "good" and "bad", depending on their use and objectives.

The indications to spin again, go back or stop for some turns were then linked to the "morality" of an invention: for instance, whoever arrived at the square of artillery, "terrible engines of war", must start the game again[132]. Gunpowder likewise made you lose the chance of playing the game and the player might "spend his time in lamenting the waste of human life occasioned by this composition"[133]; conversely, the space dedicated to lifeboats, which had been saving "thousands of valuable lives"[134], allowed the player to spin again.

Quite meaningfully, the *Circle of Knowledge*, published in 1848, employed many of the images and contents of the previous games[135], but did not refer to any moral judgment or good and bad behaviour. Science, celebrated in all its marvellous consequences on British people's life, was finally more than enough.

4. Conclusions: a different kind of scientific instrument

In a period when a flourishing market based much of its fortune on items for children and their families, educational card and board-games were just the right objects in the right place at the right time. In addition, science-themed games met the strong appreciation of the public and spread interest for sciences. On the one hand, they seem to collect the inheritance of mathematical and physical recreations, which had had so much success between the XVIIth and the XVIIIth century, by offering a rational pastime, that is, a respectable way to spend one's leisure time within domestic environments. On the other hand, they situated themselves in the wake of the commercial success of books of science popularization and education and of portable scientific instruments[136]. Namely, they were just at the crossroads of books and instruments. They were in fact visual, concrete objects which, similarly to scientific instruments, required an interactive fruition based not only on manipulation, like several, innovative books of the time[137], but also on continuous trespassing beyond the board, up to the domestic space and outwards. But, differently from scientific instruments, board-games did not only represent a valuable eye to discover, by playing, science and its images (exactly like a telescope is an eye on the cosmos): they were also able, similarly to books, to convey moral contents. Placing themselves in this dimension, straddling two different learning devices, science-themed board-games were capable of capturing players' attention, thanks to their beautifully engraved squares; of amusing

[132] Wallis, ([1830], p. 7).
[133] *Ibidem*, p. 9.
[134] *Ibidem*, p. 10.
[135] Such as from the *Wonders of Nature* and the *New Game of Genius.*
[136] See Hochadel (2003).
[137] Reid-Walsh (2017).

their minds, thanks to the challenging game; physically involving young boys and girls, thanks to the teetotum, the markers, the materiality of the boards or cards and sometimes thanks to the experiences to reproduce; and, finally, of teaching thanks to the instructions and the rich digressions provided.
The Wallises' catalogue is only a limited, although representative, part of a richer corpus of science-themed games which have been printed across Europe since the XVIIIth century. To further investigate this corpus, widening the view towards other periods and countries (France, first of all), means to rely on still unexplored visual and material sources which have a lot to say on the circulation of scientific knowledge, its fruition and the relation between its production and its communication. Future research aims to move in this direction.

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v. Figure Legends

Img. 1 **–** *The new game of Genius* (Wallis [1830 ca]). Ciompi&Seville Collection (www.giochidelloca.it).
Img. 2 – *The Pleasures of Natural Philosophy* (Wallis, 1805). Ciompi&Seville Collection (www.giochidelloca.it).
Img. 3 – *Arithmetical Pastime* (Wallis, 1798). Ciompi&Seville Collection (www.giochidelloca.it).

Annexe 3. **Playful Encounters. Science-themed card and board-games across the Channel (1790-1850 ca).** Article envoyé aux Archives Internationales.

"Aucun de ces faits ne vivra dans la mémoire des hommes, s'il n'a été jeu de l'oie. En tous les temps, on s'est avisé d'enfermer dans les cases symboliques ce qui frappait l'imagination, ce qui méritait de prendre place dans nos annales, la vie de nos grands souverains, les exploits de nos guerriers illustres, les découvertes de la science"[138]

Abstract
Since their origins, board-games and card games have been protagonists of encounters and exchange among countries. Educational games, about history, geography or sciences, are no exceptions. This paper focuses on science-themed games which circulated between London and Paris during the end of the Eighteenth century and the first half of the Nineteenth century: the period saw in fact the peak in the production of educational games, but also in the cross-fertilization from France to England and back. For this reason, they can be a valuable source (still understudied) in order to investigate the circulation and dissemination of scientific knowledge from a new perspective. Some of these games were translated, but within the translation process some elements were modified; some others simply shared the same topics, but they did represent and communicate them in (meaningfully) different ways. As it will be shown, in fact, French and English authors and publishers addressed different contexts and audiences and proposed different uses for these games: consequently, scientific notions and images were re-elaborated and transformed from time to time.

Keywords: science-themed games; board-games; card games; scientific knowledge; science popularization; science education.

1. Introduction: playful encounters

Since its origins, the Game of the Goose has been the protagonist of many encounters and exchange among countries. First created in Italy, it arrived in Spain around 1580 as a gift from Francesco de

[138]"Le Journal Illustré" (3 Janvier 1892), quoted in GIRARD & QUÉTEL, *Histoire de France*, 1982, p. 37

Medici for Philip II; then, it was printed in England: the first attested copy dates back to 1597.[139] Only one year later, the earliest surviving French Jeu de l'Oie, very similar to the English version, appeared.[140] As it crossed borders, it also crossed different socio-cultural contexts: we know that King Louis XIII played it; but it was also used by students in ad-hoc versions; finally, it reached popular contexts.[141] Born as a game for adults, it became one of the pastimes of choice for young people between the eighteenth and nineteenth centuries.[142] Such versatility made the Game of Goose the object of continuous metamorphosis: thus, if the rules have basically remained the same, the original iconography has been replaced, from time to time, by a wide range of images, themes and contents, depending on the audiences addressed and the intended circulation.

A similar discourse may apply to playing cards, whose history crosses even more moments in time and places than board games and their origins are so very ancient that it is difficult to assess where and when the first deck was invented.[143]

In the light of this richness of primary sources and meanings, the history of board games and playing cards have been largely investigated. In the last decades, several scholars have successfully demonstrated how and how much these games can tell us about cultural and social aspects of the ages and places within which they were conceived and circulated. Two brilliant examples, both regarding the Game of the Goose, are offered by the volume *Cultural legacy of game of the goose*[144], by Adrien Seville, and the outstanding *L'histoire de la France récontée par le jeu de l'oie* by Girard and Quétel. These two works recall how a special place among board games is occupied by educational variants[145], which appeared on the French market during the XVIIth century and later reached England, Germany, Italy and the Low Countries. However, Seville points out that no countries showed the richness of subjects as France and England, at least with reference to the second half of the XVIIIth and the first decades of the XIXth century - a period which saw a real explosion of items for children's education and their families.[146]

The wide and heterogeneous circulation of objects (such as boards, cards, etcetera) and the constant exchange across time, space and contexts which characterize the history of games in general, also apply, more specifically, to educational games. For instance, we know that dissected maps, which indeed can be considered a sort of an educational game, were first sold in England, and their invention is attributed to John Spilsbury: however, as J. Shefrin has discovered[147], some sources lead to the figure of Madame Beaumont, a French woman who had been living in London between 1748 and 1752. Smilarly, B. Gribling points out that "the anonymous author of the rulebook to *An Historical Game of England* (1804) […] noted its debt to the pedagogy of Abbé Gaultier", a priest in exile.[148] That is not an isolated case. Exiled priests do seem to have played a key-role in the history of educational games: at the beginning of the Eighteenth century, the genre was introduced in the Dutch Republic by exiled French Huguenots, as recalled by Spaans.[149] It is worth recalling that early board games about war and

[139]SEVILLE, *The Cultural Legacy*, 2019, p. 26-27; p. 107.

[140]SEVILLE, *The Cultural Legacy*, 2019, p. 40.

[141]ARRIF & al., *Jeu de l'oie. Histoire et métamorphoses*, 2019, p. 34; GIRARD & QUETEL, *L'Histoire de France*, 1982; SEVILLE, *The Cultural Legacy*, p. 14; p. 39)

[142]SEVILLE, *The Cultural Legacy*, 2019, p. 14-15. Seville refers to Strutt, *The Sports and Pastimes of the People of England* , 1801, p. 265-266.

[143]PERRY HARGRAVE, *A history of playing cards*, 1966; see also WILLSHIRE, *A Descriptive Catalogue*, 1876.

[144]SEVILLE, *The Cultural Legacy*, 2019, p. 333-350. Seville reflects on board-games as sources for cultural history.

[145]One must not forget Shefrin's works: SHEFRIN, *The Dartons: Publishers of Educational AIDS*, 2009; ID., *"Make it a Pleasure and Not a Task"*, 1999a.

[146]SEVILLE, *The Cultural Legacy*, 2019, p. 37.

[147]SHEFRIN, *Neatly dissected for the instruction*, 1999b.

[148]GRIBLING, *Playing with the past*, 2020, p. 195.

[149]SPAANS, "Playing with History", 2010, p. 65. Moreover, as we are going to see, it was an exiled priest to author the first science-themed card game published by Wallis, at the end of the Eighteenth century.

fortifications, whose origins were in France, were translated several times, in Germany and most certainly in the Low Countries.

No surprise then that the second half of the Eighteenth century, when educational games knew the peak of their success and diffusion, saw many cases of translations or re-editions. A paradigmatic example is offered by the board and card games dedicated to the teaching of history and universal chronology, which appeared, among others, in England, France and Germany and knew different versions, being transformed according to the different audiences from time to time.[150]

Science-themed games were no exception. An intriguing board-game, titled *Arithmetical Pastime* and published in 1795 by John Wallis in London, had been translated from a previous German edition, released in Nuremberg in 1725. Unfortunately, of the original version only one sample of the board-game survived and neither did any pages with instructions, so we cannot say if and how the English version was changed.

Most evident are the ties between London and Paris[151]: after all, these two European capitals had always been interested in each other's print market and exchanges of different sorts had become common since the XVIIIth century.[152] Astronomical and botanical cards, board-games dedicated to natural history and natural philosophy became a sort of pastime very well-known and appreciated by English and French boys and girls.

As an aside, it is worth noting that scientific subjects can be found from very early on both in Paris and London. One of the first French educational games[153] was the *Jeu des Fortifications*, which, similarly to other games dedicated to wars or heraldry, were addressed to the young cadets, seeing that such matter was an essential part of nobility's education. What is most interesting here is that in this game, which had numerous editions between the XVIIth and XVIIIth century, principles of geometry were taught, as players were instructed about the geometrical foundation of fortification building. Another example, even older, is represented by the astonishing *Jeu de la Sphère*, printed in 1661 by Étienne Vouillemont, who was the "graveur ordinaire du Roy pour les cartes géographiques": the board-game illustrated the structure of the Universe following the Tycho Brahe system; quite interestingly, an inscription on the board recommended to those who wanted to acquire ~~a~~ more detailed knowledge to read Sacrobosco or Claulus or Boulangerand.[154] In London, the very first examples are instead represented by some decks of cards which had mathematics and geometry as their main theme, as showed by a series of astonishing primary sources, to date unstudied.[155]

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[150]See the board-games listed under the category "history" in Seville and Ciompi catalogue available online at http://www.giochidelloca.it/ricerca.php?init=2&pagina=2&ordine=anno.

[151]On the cross-fertilization from France to England, see SEVILLE, *The Cultural Legacy*, 2019, p. 108.

[152]ROY, "La gravure dans le rayonnement culturel de la capitale", 2008.

[153]According to Seville, the first French educational board-game probably was the *Jeu du Monde*, by Pierre Duval, the King's geographer, published in 1645 (SEVILLE, *The Cultural Legacy*, 2019, p. 46). The first educational card deck is instead usually attributed to Thomas Murner (1475-1537), a Franciscan friar who used the cards to help his students in Krakow to memorize rules of logic. The cards, together with the textbook, were printed in Strasbourg, in 1507. However, it is likely that other educational card decks were already circulating, as mentioned in DELGADILLO, *A World of Symbols*, 2019, p. 273-283. See also the historical accounts given by SINGER, *Researches Into the History of Playing Cards*, 1816, p. 217.

[154]"Ceux qui désireront avoir une plus profonde connaissance de tous ces signes ou figures célestes, ils liront Sacro Bosco et Claulus ou Boulangerand". See D'ALLEMAGNE, *Le noble jeu de l'oie*, p. 93-94. To date, the game has not been the object of a dedicated study yet; nevertheless, the contents are of extreme interest and historical significance.

[155]MOXON, *The Use of Geometrical Playing Cards*, 1697; [TUTTEL?], *Arithmetical Cards*, s.d.; TUTTEL, *Mathematical Cards*, [1701?]. The ensemble of these three card decks is wonderfully intriguing. Tuttel was an instrument maker and his deck *Mathematical Cards* has been claimed to have served as advertisement, since it depicted mathematical and astronomical instruments. The *Arithmetical Cards*, anonymous, could probably be attributed to Tuttel as well: this deck is educational (WILLSHIRE, *A Descriptive Catalogue*, 1876, p.235) and it can depend on the fact that instrument makers also taught arithmetic in their shops (BEELEY, "Practical mathematicians and mathematical practice", 2019). Moxon's *Geometrical Cards* are an enigmatic source: they were printed within a volume containing the *Traité sur la Méchanique* by Descartes and other brief texts on mechanics. The cards illustrated the principles of geometry and simple machines (the figures are very similar

However, as clearly said by Seville, it is only from the second half of the XVIIIth century that the first traces of a cross-fertilization between France and England can be identified.[156] This claim applies to science-themed games too. A quite rich corpus of primary sources, which, to date, has not received the attention it deserves, shows in fact that several science-themed card and board-games shared the same subjects –we also have two cases of translation. Nevertheless, identical topics were represented in very different ways by London and Paris' publishers and even the translation process implied meaningful modifications. The aim of this paper is to precisely investigate these games and the transformations which they underwent, trying to assess their intended and actual circulation, the aims of their authors (or editors) and the audiences they wanted to reach. More importantly, ~~it~~ how the scientific knowledge transmitted by these games was elaborated and narrated will be considered, for instance, through the illustrations and the explanations contained in the booklets of instructions. Changes introduced reflect not only a diverse context, but also a diverse public, a diverse function and, finally, a diverse way of talking about science.

The analysis situates itself at the crossroads of multiple disciplines. Despite owing much to the cultural history of games[157], it primarily relies on the studies of the history of science and more precisely to those studies which investigate the visual and material aspects of the circulation of scientific knowledge in relation to the history of education. For the nature of educational games, in fact, a central role is played by the works which have recently shed a light on the effective uses of teaching aids, interactive books and educational toys.[158] More specifically, an important place is occupied by scholarship in the field of history of science education the reference is a precious volume edited by S. Tailarach-Vielmas[159] and to the studies by M. Keene, one of which focuses on a science-themed board-game.[160] At the core of this research also lies the rich corpus of works devoted to the history of science popularization, which have successfully highlighted the multiple, fascinating reverberations of science in public between the XVIIIth and the XIXth century. The concept of "spectacle of science", with reference to the first balloon flights or electrical experiments; the diffusion of portable, scientific instruments within domestic environments; the role of images, diagrams and even objects in the dissemination of emerging theories from learned circuits to laymen are all fundamental aspects which the analysis of science-themed games will constantly explore. Finally, valuable help will also come from the works devoted to translation and cultural transfer:[161] the concept of "cultural transfer", in fact, can be properly applied to the process of transformation which the games underwent when reedited in new versions (from French to English or vice versa).[162]

2. From France to England and back

to the ones from Guidobaldo Dal Monte's *Mechanicorum Liber*). Further research will hopefully shed a light on this corpus. On Moxon and his collaboration with Tuttel see WAYLAND, "A Puzzle Solved", 1966.

[156]SEVILLE, *The Cultural Legacy*, 2019, p. 108.

[157]SEVILLE, *The Cultural Legacy*, 2019; GIRARD, QUETEL, *L'Histoire de France*, 1982.

[158]GRIBLING, *Playing with the past*, 2020; REID-WALSH, *Interactive Books*, 2017; GRENBY, *Delightful Instruction*?, 2016; MICHALS, *Experiments before Breakfast*, 2016; KLEMANN, "The Matter of Moral Education", 2011; TAYLOR, "Mogg's Celestial Sphere", 2009; SHEFRIN, *The Dartons*, 2009; HEESEN, *The World in a Box*, 2002.

[159]Although Tailarach-Vielmas' work is dedicated to "science popularization", the book offers numerous insights about science education (demonstrating, once again, how blurred the borders between education and popularisation are). In particular, see the chapter by SECORD, *Newton in the Nursery*, 2011.

[160]KEENE, "Playing among the stars", 2011; KEENE, "Familiar Science in Nineteenth-Century Britain", 2014.

[161]THOMSON, BURROWS, DZIEMBOWSKI, *Cultural Transfers: France and Britain*, 2010; STOCKHORST, "Introduction", 2010.

[162] To a small extent, the analysis will contribute to the research about the cultural exchanges between London and Paris within the print market. See ROY, *Un aspect méconnu*, 1995; IDEM, "The Art of Trade", 2008; IDEM, "La gravure dans le rayonnement culturel de la capitale", 2008.

The two translations mentioned above are a translation from French to English of a board-game and a translation from French to English of a card game. In both cases, the original version was modified and the contents were significantly adapted to a new context and new buyers, as well as to a precise idea about these games' possible uses. All these transformations, on the one hand, lead to a different circulation and reception of scientific notions disseminated through these games; on the other hand, they were themselves the results of a diverse conception of scientific knowledge and of its transmission to students and laymen.

The first game to be considered is the *New Game of Human Life*, which arrived at John Wallis' shop in 1790 and benefited from the help of Elizabeth Newbery, who appeared as the second publisher and sold the game in her shop too. It was originally conceived in 1775 by Jean-Baptiste Crépy, one of the famous printers of rue Saint Jacques' *imagerie*[163]: it is meaningful that the first moral English game, which would generate quite a rich series of similar games, was brought from France.[164]

The board-game, as the title reveals, was not about a scientific topic: instead, it conducted the players through the different ages of life, from infancy to old age, and showed good and bad behaviour, represented by the characters depicted on each space. Players had to roll the teetotum[165] and move their pieces: if the marker stopped on a space displaying a positive model (like the Studious Boy, at number 7, or the Temperate Man, at number 58) then the player could get another turn, go forward and receive one or more stakes; on the contrary, if the piece stopped on a negative model (like the Duellist at number 22 or the Drunkard at number 63), the player had to step back, skip a turn or pay some stakes. Since the joint booklet did not describe the characters, but it only named them, it was the parents' task −or other adults who were taking care of the children− to explain what the figure represented and what its meaning was. Rules were very clear regarding this point:

"If parents who take upon themselves the pleasing task of instructing their children (or others to whom that important trust may be delegated) will cause them to stop at each character and request their attention to a few moral and judicious observations, explanatory of each character as they proceed and contrast the happiness of a virtuous and well spent life with the fatal consequences arising from vicious and immoral pursuits, this game may be rendered the most useful and amusing of any that has hitherto been offered to the public".[166]

Some of the characters displayed, however, were "men of science", and this is the first reason why this game, even if not specifically a science-themed one, is of interest to us[167]. Furthermore, these characters had been changed from the French edition, thus representing a key-issue to deal with: how were they chosen? And what was the message they had to convey, according to Wallis?

The first one is James Cook (1728-1799).[168] In the French version, the space dedicated to the "Geographer" represented a quite an anonymous man sitting in a room, while reading a book. Wallis and Mrs. Newbery introduced instead the portrait of the eminent English explorer and cartographer,

[163] MILANO, "Imagerie Parisienne", 2008.

[164] See SEVILLE, *The cultural legacy*, 2019, p. 109; p. 166-169.

[165] As specified on the board, the teetotum was the "moral" counterpart of dice, which should not enter private homes.

[166] WALLIS, NEWBERY, *The New Game of Human Life*, 1790. Rules are displayed on the board.

[167] We have other examples of card and board-games which did mention several men of science, even if science was not their main theme. See for instance the historical games by Darton and by Wallis recalled in GRIBLING, *Playing with the past*, 2020, p. 197-198 and p. 205.

[168] According to The Liman Collection of Board Games and Puzzles of the Brown University Library, at https://library.brown.edu/create/limangames/the-new-game-of-human-life/. Accessed on 12th April 2021. See also SEVILLE, *The cultural legacy*, 2019, p. 168.

depicted in the act of looking at a terrestrial globe. The presence of a geographical but also scientific instrument such as a globe is nothing but negligible, since it immediately affirms, to the players' eyes, the conceptual framework in which Cook had to be placed. Both terrestrial and celestial globes were among the most widespread scientific instruments in the domestic environments (there were also portable exemplars, like the ones manufactured by Benjamin Martin[169]): hence, they were easily identifiable objects and their uses were well known among families. Obviously, the decision of employing Cook's picture has a double meaning: the celebration of a key-figure of English explorations both relates to the will of emphasizing, on the one hand, scientific missions, their protagonists and the great advancements accomplished during the second half of the XVIIIth century; on the other hand, one cannot ignore the attempt of glorifying the British Empire and its discoveries.[170] These two intertwined dimensions perfectly coexisted in Cook, who was then presented to children as a valuable model, where scientific knowledge met a certain political clout.

[Img 1] *The New Game of Human Life*. From Liman Collection of Board Games & Puzzles, John Hay Library, Brown University (Public Domain).

A similar discourse may apply to the second character to be considered, that is, Isaac Newton,[171] even if with different nuances. In the French version, the last space, that of the Immortal Man, which closed the game and sealed the victory of the player who first reached it, did in fact represent Voltaire, but the English context was determined to find a different option. Wallis and Newbery easily substituted Voltaire with Newton: the presence of Elizabeth Newbery probably played a fundamental role in that, since her uncle's major editorial success were the Tom Telescope's lectures, centred on Newton's natural philosophy.[172] But beside that, the choice was rich in meaning, in any case. First of all, it implicitly asserted the link between immortality and scientific knowledge: science, and namely mechanics and Newtonian mathematized physics, gives access to a never-ending memory. Celestial mathematics[173], applied to the study of the Cosmos, elevates the spirit and consigns the soul to eternity. In short, a life dedicated to science results in being a desirable one. However, in the same way Cook did not just symbolize the nobility of scientific and geographical explorations, but also their importance for the prestige of the Empire, Newton did not simply impersonate the value of scientific inquiry, but also the value of a moral life. He was, to say with Secord's words, "the acceptable face of science".[174] It is morals, together with natural philosophy, to effectively ensure immortality. Such a narration can be found in several of the games published by the Wallises, and reflects a more general tendency shared by books of education and science popularization addressed to a juvenile audience, where the transmission of scientific knowledge was never disjointed from moral teaching.

Curiously, one of the few cases in which we do not find some traces of moral teaching alongside scientific contents is represented by the card game *The elements of astronomy and geography*, published by John Wallis in 1795. Following the opposite direction to the one of the *New Game of Human Life*, these playing cards circulated in their English original edition ~~at~~ first and would be

[169]See MILLBURN, *Benjamin Martin*, 1976. Milburn's study is still today the most complete about the life and work of Benjamin Martin.

[170]NORCIA, *Gaming Empire in Children's British Board Games*,2019, chapter 1.

[171]ROVEE, "The New Game of Human Life, 1790", 2015, p. [1].

[172]SECORD, "Newton in the Nursery", 2011.

[173]BIAGIOLI, "The Social Status of Italian Mathematicians", 1989, p. 53.

[174]SECORD, "Newton in the Nursery", 2011, p. 35. See the definitions of the "Godly Naturalist" and the "Moral Philosopher" proposed by SHAPIN, in "The Image of the Man of Science", 2003, p. 162-167.

translated into French only 15 years later[175]: some textual changes, as well as brief journal advertisements, interestingly suggest that the French version probably reached different audiences and uses.

Unlike the vast majority of Wallis' games, the author of the cards was known: it was the Abbé Paris, whose full name was Louis Michel Paris (Argentan, 1740-1806), a French professor of Latin, Astronomy and Geography born in Normandy[176]. In 1792, due to a condemnation received in revolutionary France, Paris was forced to leave his country and move to London, where he would remain for 9 years. Here, he worked in an English school for refugee children, funded by the abbot Carron[177]. It is most likely that, during his stay, he got in touch with Wallis; it is equally probable that it was Paris who gave Wallis the idea for a new item in his catalogue. We in fact know that not only for domestic instruction, but also in schools, board-games and playing cards had been used for decades to teach students –and particularly in France: a very representative example is given by the *Jeu des Fortifications*, introduced by the Jesuits already in the XVIIth century.[178] And moreover, it was the first science-themed game for Wallis –many others would follow.

The 40 cards, measuring 9x6 cm, illustrated fundamental notions in the field of astronomy and geography: each card showed the image on the front and the correspondent explanation on the back. The goal of the game was to properly describe the image without reading the description to get the point. The first card of the deck had the picture of an armillary sphere, whose caption read: "A SPHERE means a round body, encompassed by circles, lines, and points". [179] The choice of depicting the sphere on the first card depended on the fact that it was very often suggested to students to use one to learn astronomy and geography. It is much more probable that Paris himself used one with his students, so that he accorded a basilar importance to the instrument and its knowledge. In fact, the cards immediately following provided players with the simplest and most fundamental notions, which ranged from the illustration of the "map of the World" (card II) to the definition of lines (card III) and circles. Afterwards topics became more complex: cards from XXXIV to XXXVII, for instance, described the eclipses.

[Img 2] The first card (recto and verso) from the French version of the card game *The elements of astronomy and geography*. Source gallica.bnf.fr/BnF.

When, in 1810, the French edition came out, the abbot Paris had recently passed away. But before dying, according to the few biographical sources[180], he had been able to modify the contents of the cards. If we compare this version with the original English one, some differences do, in fact, emerge. The most evident concerns the number of cards, which became 42: two cards had been added and the deck now ended with two volvelles. Coloured illustrations, engraved by Pierre-François Godard, member of the famous family of printmakers of Alençon, were basically the same, except for some details: for instance, the armillary sphere rings were more precise and easily readable, in particular the Zodiac's ring. The text, printed by the Frères Brée in Falaise, had undergone several modifications: the general impression is that the abbot Paris desired to enrich the information provided, so that many descriptions were improved and extended. Among others, a representative example is offered by card XII, dedicated to the Equator: if the English version simply said that it "divides the Globe into two equal

[175] ABBE PARIS, *Jeu d'astronomie et de géographie*, 1810.

[176] "Paris, Louis-Michel", 1836, p. 537.

[177] Guy-Toussaint-Julien Carron (1760–1821). See *Vie de l'abbé Carron*, 1866.

[178] See HARGRAVE, *A history of playing cards*, 1966, p. 62-65. GIRARD & QUETEL, *L'Histoire de France*, 1982, p. 15-20; JACOBS (2012, p. 2). See also VAN DAMME (2019, p. 181), about the heraldic games proposed by Jesuits.

[179] ABBÉ PARIS, *The elements of astronomy and geography*, 1795, card I.

[180] "Paris, Louis-Michel", 1836, p. 537.

parts" and that "it is the measure of time", the French version also introduced the concept of Latitude and referred to the planisphere and following cards for further explanations. Considering that Longitude was already introduced ~~at~~ on card XIII in the original edition too and that card XVI would talk again of both Longitude and Latitude, it seems probable that the abbot Paris had realized that adding a definition of Latitude might help players and their learning. Thus the implementations seem to aim at optimizing the use of the cards and their instructive function. In addition, one may hypothesize that the abbot, while revising the contents, had in mind a slightly different audience and circulation for the French edition. Such differences, in fact, may depend on the fact that the English deck was addressed - as usual for London's market- to domestic environments and schools: cards would be used by children together with their parents or teachers, who would explain what the cards did not. On the contrary, the French deck could be designed for a more heterogenous audience, who needed to find all the information from the cards on their own.

Such a change of destination is also suggested by meaningful, although few, details and first-hand accounts. First of all, in the original version, card X mentioned the "students who begin to study the Globes", whilst in the 1810 edition the term "students" became "Those who start studying the globe"[181]: the expression enlarged the expected public, which generally included people who wanted to learn astronomy and geography, and not forcefully only students. Secondly, it is worth noticing that the title changed: the *Elements of Astronomy and Geography* turned into *Jeu d'astronomie et de géographie*: if the term "Elements" recalls textbook material, it is clear that its substitution with the term "Jeu" aimed at disassociating the card deck from a purely didactic dimension and highlighting other possible uses[182]. Further evidence confirms this assumption.

The game was advertised in French newspapers. In August 1808, *Le Moniteur* and *L'Epicurien Français* presented the cards to their readers, by saying that they were "equally instructive and fun"[183] and with no mention of an intended audience made solely of students. Moreover, *L'Epicurien Français* added that they were "very useful for those who want to learn, with no trouble and at a low-cost, some very extensive notions about the two sciences in question"[184]: again, it seems that the French edition was both thought and perceived more like a tool to "popularize" than an educational instrument[185]. No surprise then to find the game listed among the books at the auction of an anonymous French architect[186] and numbered in the catalogue together with the *Abregé d'Astronomie*[187], a popular treatise on astronomy, conceived for "the great number of amateurs"[188]. And amateurs, indeed, are configured as the intended players of the game in its French transposition.

This shift is not only interesting *per se*, but also when seen in relation to other science-themed games and the transformations they went through across the Channel, as shown in the following section.

3. The same but different

[181] "Ceux qui commencent l'étude du globe", in ABBE PARIS, *Jeu d'astronomie et de géographie*, 1807, card X.

[182] Wallis too would never use the term "Elements" again and would prefer the expression "educational game".

[183] "Les connaisseurs sauront apprécier le mérite de ces cartes, également instructives et amusantes", *Le Moniteur*, 15 Août 1808, p. 896.

[184]"Elle seront très-utiles aux personnes qui voudront acquérir, sans peine et à peu de frais, des notions assez étendues sur les deux sciences qui en sont l'objet", *L'Epicurien Français*, Tome XI, Août 1808.

[185] Although it may be argued that a precise line dividing popularization from didactics cannot be traced.

[186]*Catalogue de livres*, 1856.

[187]It was written in 1774 by the astronomer and populariser Jérôme Lalande (1732-1807). See AMPOLLINI, *Cronaca di una cometa (non) annunciata*, 2019.

[188] «Le plus grand nombre des amateurs», in LALANDE, 1774, p. III.

Besides the evident exchanges at the heart of the two translations seen above, other science-themed board-games which were printed between France and England –namely, Paris and London– must be considered as well. Even if we do not have any direct, explicit proof that a process of translation was involved in their circulation, these games were centred on the same topics and they were all equally defined as educational instruments, so that it is possible to hypothesize that they were somehow related. However, despite the similar use of the adjective "educational", differences suggest that not only these games reveal diverse ways of talking about science, but also that they were probably conceived and transformed to suit diverse audiences and uses.

Natural history, and precisely animals, are one of the most recurring scientific themes, predictable seeing that these games were addressed to children. In 1813, John Wallis created the board-game *The naturalist: a new game, moral and instructive*.[189] As suggested by the title, moral teachings, which had been at the core of previous French board-games inspired by the tales of La Fontaine and Aesop[190], were maintained. But more information on each animal was given. The tradition of educating children through animals' good and bad behaviour was joined by the attempt of communicating the latest acquired knowledge on mammals, reptiles, birds and fish. Therefore, descriptions contained in the booklet of instructions provided players with several details about the animals' physical characteristics, their habitats and feed, their origins and their co-existence with humans. The contents are similar, although not identical (so that the hypothesis is that the authors were different), to another item from Wallis' catalogue, which was published in the same year, called *The Good Childs Cabinet of Natural History*. It was a little box containing a set of small volumes, each of which were dedicated to a different class of vertebrates. It is difficult to assess if Wallis was inspired by French card-games which had been published at the turn of the XVIIIth and the XIXth century, but similarities are evident. Composed of 52 cards and authored by Louis-François Jauffret, the *Jeu zoologique et géographique* bore the figures of "quadrupeds" and "bipeds" from all the continents, accompanied by a "synthetic explication taken from the best Naturalists".[191] The *Neuvième Jeu des Cartes Historiques*, signed by Jouy and devoted to the history of animals, showed a similar structure.[192] Although the *Cabinet* by Wallis was not properly a card-game, the way the pages looked was the same.

Going back to board-games always in France, the board-game by Jean must be mentioned, which appeared in his catalogue in 1810. The *Nouveau Jeu d'Histoire Naturelle Dedié à la Jeunesse* portrayed 63 animals, but the only descriptions provided were at the corner of the board and focused on the elephant, which was associated to the victory square, the giraffe, the dromedary and camel and to the deer. Five years later, Basset proposed to his customers the *Jeu Instructif d'Histoire Naturelle des Animaux*. The title recalls Wallis' game and suggests the creator's intention to instruct young players about animals. The illustrations were taken from the *Histoire Naturelle* by Buffon, thus making the link with a scientific work very clear. Nevertheless, no contents are offered to the players besides the very brief captions identifying animals directly on the squares, so that the adjective "instructif" results in being, at least partially, unjustified, especially if compared to English board-games. In 1820, the famous publisher Darton released two more board-games about natural history: one devoted to British and

[189]WALLIS, *The naturalist,* 1813.

[190]It is clear that we are not referring here to the although numerous games depicting animals in relation to the tales by La Fontaine or Aesop, as the *Jeu Instructif des Fables de la Fontaine*, printed in Paris by Basset around 1780 and the *Jeu des Fables d'Esope*, which Basset published in 1812. There is also an example, titled *La Fontaine in the Game of the Goose*, where the French and English languages are mixed: this game too appeared in Paris, thanks to Demonville (1810).

[191]JAUFFRET, *Jeu zoologique et géographique*, 1798, Avis.

[192]JOUY, *Neuvième Jeu de Cartes Historiques*, 1808.

Foreign Animals[193] and the other one to British and Foreign Birds.[194] Both the subheadings ran the inscription "A New Game - Moral, Instructive and Amusing. Designed to Allure the Minds of Youth to an Acquaintance with the Wonders of Nature". We recognize here, like in Wallis' board-game, the intention of teaching morals together with Natural History;[195] differently from French games these two new titles were accompanied by a booklet of instructions: whilst the adjective "amusing" could be questionable -and probably was-, there is no doubt about the term "instructive". The two booklets, in fact, of more than 50 pages each, offered to young boys and girls long and accurate insights on every animal. It is clear that the presence or absence of the booklet affected the contents which could effectively be taught, as well as the nature of the game itself.

Similar considerations can be made about those board-games "exhibiting the wonders of nature". This theme, also quite recurring, was both proposed in 1818 by Wallis in London and in 1825 in Paris by Basset. The board-game by Wallis, titled *Wallis's elegant and instructive game exhibiting the wonders of nature in each quarter of the world*,[196] was a journey across incredible landscapes: volcanoes, like the Sicilian Etna; South American mountains; rivers, lakes and waterfalls (for example, the Niagara Falls); the Arabian desert; caverns and caves; but also waterspouts and earthquakes were pictured in detail in the designated booklet. Regarding earthquakes, for instance, the anonymous author (or Wallis himself) wrote that, despite the various attempts made by philosophers, it was still unknown what causes seismic events. He then observed that they are usually "preceded by an extraordinary stillness of the air" and "subterraneous noises" and he finally recalled that one of the last tragic events had been the Lisbon earthquake, in 1755.[197] The romantic leitmotiv of a sublime Nature took shape: players were taken by hand through wonderful and frightening spectacles of nature, in front of which the curiosity, the wonder and the marvel go together with the sentiment of terror and deference before this powerful Nature that man cannot dominate.

The rules of the game followed this paradigm: in front of the ice mountains, on space 12, "Whoever is so daring as to venture amidst these awful scenes, must be frozen in, while the other players spin thrice round",[198] whilst the Vortex of Maelstrom (space 24) force the player to start the game over".[199]

[Img 3] *Wonders of Nature*. Ciompi&Seville Collection, www.giochidelloca.it.
[Img 4] *Jeu Instructif des Animaux*. Ciompi&Seville Collection, www.giochidelloca.it.

Interestingly, very similar landscapes can be found in Basset's board-game, which combined both Wallis' game *Wonders of Nature* and the game dedicated to the "wonders of rt[200] Even if we do not have direct evidence that Basset knew Wallis' games and intentionally conceived a new board-game, the *Jeu Instructif des Merveilles de la nature et des arts*[201] seems to owe much to Wallis' catalogue. The two games were presented by Wallis himself as companions[202], so that Basset's idea of combining them might have come from that. Illustrations immediately recall the romantic atmosphere of Wallis'

[193] DARTON, *British and Foreign Animals*, 1820.
[194] DARTON, *British and Foreign Birds*, 1820.
[195] The aspect of the game *British and Foreign Animals* is very similar to *The Naturalist* published by Wallis.
[196] From now on, *Wonders of Nature*.
[197] WALLIS, *Wonders of Nature*, 1818, p. 4-5.
[198] WALLIS, *Wonders of Nature*, 1818, p. 11.
[199] *Ibid*., p. 19.
[200] WALLIS, *Wonders of* Art, 1820. From now on, *The Wonders of Art*.
[201] BASSET, *Jeu Instructif des Merveilles*, 1825. The game is described in LEBRUN, *Nouveau manuel complet des jeux de calcul*, 1840, p. 9.
[202] WALLIS, *The Wonders of Art*, 1820, p. 15.

layout: volcanoes, geysers and waterfalls delineate the image of a sublime Nature which should be admired and feared at the same time, whilst ancient monuments and ruins efficiently retrace the ideal places of a Grand Tour. Differently from Wallis' *Wonders of Art*, however, Basset does use the term "art" only in relation to architectural "wonders": on the contrary, Wallis had put together a fascinating, heterogenous ensemble of subjects, so that "art" did refer to monuments like the Colosseum or the Pisa Tower, but also to artifices created by science. Meaningfully, the first case was devoted to the diving bell, whose function was then accurately described in the booklet of instructions; further on, players ran into the steam vessel, one of the most recurring symbols of industrial revolution; finally, a hot-air-balloon was displayed on square 22, not before mentioning the telescope built by Herschel in 1789, depicted on square 14. Rules too were significantly different from Basset's edition. In Wallis' board-game, in fact, descriptions were seldom followed by a series of questions which participants needed to answer in order to proceed: following Herschel's telescope, for instance, the number of planets and the number of their moons were asked.

Some handwritten inscriptions on a copy from the Seville collection[203] testify that such contents were well perceived in all their complexity: the copy, a gift from a father to his child, reveals that the father (or another adult) had reworked the instructions. Handwritten pages, intended to substitute the official booklet, gave much briefer and simplified descriptions, thus, on the one hand, making the game faster (as descriptions were to be read aloud, thus requiring much time) and, on the other hand, making notions easier to remember and questions easier to answer. At the same time, these elaborations, like also the titles of the squares added on the board, confirm that, at least in this case, the game was actually used as an educational tool, as the simplifications were in all likelihood introduced to foster and help young player's learning.

Nothing similar can be said of the French version. No booklet of instructions was included, so the only information provided to the players was the very brief captions of the squares: the geyser, on square 4, for instance, was simply described as a "source d'eau chaude jaillissante" one could find in Iceland. On the contrary, Wallis' edition specified that geysers were "attributed to subterraneous fires"[204] which were "accompanied by internal bellowings and shakings of the earth". After specifying that they could reach a height from sixty to ninety feet, the player read that they could represent a danger for the spectator, since they might unexpectedly "burst out".[205] At the same time, whilst the *Wonder of Nature* by Wallis presented only 25 squares (probably reduced because of the length of the game, caused by the accurate descriptions to be read aloud and repeated), Basset maintained the number of 63, which basically reaffirmed the close connection with the classic Game of the Goose, as well as it being a non-educational game. No surprise then if in the catalogue "The iconography of the game of the goose", compiled in 1886 by the collector Eugène de Vick (1824-1889)[206], the board-game by Basset was defined as a "jeu à utiliser dans une assemblée de vieilles filles".[207] Even if de Vick wrote these observations sixty years later the game's publication and even if the sarcasm of his words is

[203]The copy is part of the Seville collection and was made available by Seville himself and Ciompi on their website http://www.giochidelloca.it/scheda.php?id=2214 (accessed on 26th May 2022).

[204]WALLIS, *Wonders of Nature*, 1818, p. 19-20.

[205]As said, the image is that of Nature as romantic and sublime, whose marvellous and astonishing phenomena can often be dangerous for men.

[206] His collection of prints was enlarged by his son and then donated to the French Bibliothèque Nationale. See"Note sur la Collection de Vinck", 1931.

[207]DE VINCK, *Iconographie du noble jeu de l'oye*, 1886.

evident, his judgment still indicates that the game was hardly perceived as an instructional tool for young people.[208]

A last subject, namely botany, can be found both in French and English science-themed board and card games. This time, the first game, dedicated to flowers, was published in Paris: it was Jean, in 1810, to propose the *Jeu des Fleurs*. Very close to a classic Game of the Goose, with 63 squares, it simply illustrated the names of the flowers depicted: from the "Rose Mousseuse", depicted on the victory square, to the "Anemone", then on to the "Sensitive", the vulgar name for the curious *Mimosa Pudens*, a plant capable of crumpling its leaves when touched and represented on the board more than once, in correspondence of squares usually occupied by goose.[209] Fifteen years later, Basset proposed a new version and titled it *Jeu Instructif des Fleurs*: the operation was exactly the same as what he had done with the *Jeu des Animaux*, initially published by Jean and then reedited by Basset in a renewed version. And like he had already done with the *Jeu des Animaux*, he added the adjective "Instructif" again, thus distancing his game from Jean's and claiming the instructive function of his version. However, the contents taught to the players were once again restricted to the brief captions belonging to the images: the names of the flowers were only rarely accompanied by few further details, such as references to the myths[210] or to some very simple characteristics of the plant.[211] So that the term "instructif" does not seem to effectively materialize along the game path[212]. As contrarily it did on the botanical cards game which Edward Wallis released on the London market in 1829. The deck, whose only two remaining catalogued copies are today preserved at the Cotsen Library, was composed of 54 beautifully hand-coloured engraved cards, divided into questions and answers. The wonderful slipcase ran the title "The Science of Botany according to the System of Linnaeus", where both the term "science" as well as the reference to Linnaean classification immediately testified the reliability of the contents. The author was claimed to be Mademoiselle De Clay. As John Wallis had collaborated with the publisher Elisabeth Newbery and the teacher and populariser Margaret Bryan, now the son Edward employed another woman. Unfortunately, to date we do not have much information about Mademoiselle de Clay: we only know that, the same year, she authored the interesting "Footsteps in geometry",[213] published in London by Bowdery and Kerby. The work was a small book of 12 pages, accompanied by 35 illustrated cards, which showed elementary geometrical elements, from lines to circles and polygons. However, the cards were not playing cards, so that the botanical game is to date the only "game" that can be ascribed to her, as a result of the collaboration with Edward Wallis. Since Wallis judged having her name on the cover worthy of mention, as his father had already done with the Abbé Paris and Miss Bryan's names,[214] we may hypothesize that, besides Mademoiselle de Clay's key-

[208] De Vinck's judgment and classifications of other games are indicators of the pertinence of his catalogue, particularly for what concerns the distinction he makes between games for amateurs and games for the young. See for instance p. 51. About De Vinck, see "Note Sur La Collection de Vinck", 1931, p. 294–97.

[209] See D'ALLEMAGNE, *Le noble jeu de l'oie*, 1950, p. 134-137.

[210] For instance, on square 28 "Le Narcisse Fleur en laquelle fut changé le beau Narcisse selon la fable" or, on square 44, "L'Adonide Fluer en laquelle fut changé Adonis".

[211] On square 25, one reads that "La Primevere" is "l'une des premieres fleurs du printems", while on square 40 that the "Muflier" is a "plante qui croit sur les murs".

[212] Interestingly, the victory square features the white lily, presented as the symbol of virtue, but actually symbolizing the monarchy: so that the game, at the end of the Restoration period, carried a clear political message. See GIRARD & QUETEL, *L'Histoire de France*, 1982, p. 177; BABEAU, "Les Jeux Instructifs", 1896, p. 83.

[213] The book is only listed in the online catalogue of the Toronto Public Library, https://www.torontopubliclibrary.ca/detail.jsp?Entt=RDM2189054&R=2189054. Accessed on 7th June 2022.

[214] Wallis had included Mrs. Bryan's name on the board-game *Pleasures of Astronomy*, published in 1804. Some biographical accounts on Bryan can be found in SARIDAKIS, "For the present and future happiness", 2012; BRÜCK, *Women in Early British and Irish Astronomy*, 2009, p. 15.

role in the creation of the game, her name could have been used as a guarantee of the quality and accuracy of the contents. The first question card introduced players to the subject of the game and asked "What is Botany" and "How are Plants generally divided according to the Science", whilst the following went more into detail, requesting the name of classes and orders of Linnaean system, but also the name of the flowers' parts. The answer cards, as well as depicting accurate and pleasing images to the eye, gave exhaustive although synthetic insights. The general impression is that the game might have been used to help children memorize basic notions of botany, but it was probably also suitable for amateur botanists: namely, being written by a woman, it is possible that it was addressed to amateur women wishing to acquire botanical skills.[215] These decades saw in England a genuine explosion of interest for botany: indeed, cards recall, for instance, a botanical notebook like the *Lady's and Gentleman's Botanical Pocket Book,*[216] where captions specified classes and orders of each species and blank pages were left for readers to paste samples of plants and flowers. It is certainly one of the Wallises' games potentially addressed to a more heterogeneous audience: despite that, and differently from Basset, the educational aspect is not forgotten.

Basset's choice to drastically reduce the educational aspects probably depends on several reasons, but the most evident is that linked to the usual target of his shop and, consequently, the price of his items. To do without the booklet of instructions meant to sensibly reduce the board-game's cost; moreover, his games were sold without any boxes, unlike those of the Wallises, and printed on a simple sheet of paper. The resulting product was then cheaper than the London counterparts. The Wallises' board-games cost from 8 to 10 shillings, much more, for instance, than educational books and they were not easily affordable; Basset sold his at 75 French cents (less than a shilling, more or less)[217]. In addition, it was more enjoyable, as the educational aim did not shadow the amusing side. So that, even if in this case, differently from abbot Paris' playing cards, we do not have any direct evidence, we can arguably assume that the contexts in which Basset's science-themed games circulated were at least partially different from the Wallises'.

4. From hot-air balloons to the steam locomotive

Before concluding, it is worth mentioning those games which were published in London but never reached the French marketplace – and vice-versa. Generally speaking, it must be noted that, on the basis of available and catalogued sources to date, Basset's games of 1825 were the last science-themed games printed in Paris in the XIXth century. It is not that cards or board-games stopped to attract buyers in France, nor that they did not assimilate emerging topics from contemporary life anymore: several examples show that, for instance, political facts like the Affaire Dreyfus,[218] found their place in new versions of the Game of the Goose. However, science does not. On the contrary, the English printers continued to propose new, original science-themed games. By mid-century, other publishers besides the Wallises had started to look at scientific themes, as testified by the two board-games by William Darton on British and Foreign animals and birds[219] or the earlier *New Game of Multiplication Table.*[220] Edward Wallis, for his part, enriched his catalogue with original cards and board-games which

[215] See NIETO-GALAN, *Science in the Public Sphere*, 2016, p. 96.
[216] FORDYCE MAVOR, *Lady's and Gentleman's Botanical Pocket Book*, 1800.
[217] Basset informed his buyers that the educational games were printed "au pointillé" and on a sheet 56 x 72 centimetres (the format "Jesus"). BASSET, *Catalogue*, 1822, p. 8-9.
[218] *Jeu de l'Affaire Dreyfus*, 1898.
[219] DARTON, *British and Foreign Animals*, 1820; ID., *British and Foreign Birds*, 1820.
[220] CARVALHO, *New Game of Multiplication Table*, 1830 ca.

efficiently absorbed the changes and developments characterizing the scientific and technological progress of the late Georgian and the very early Victorian ages.

The opening of the first British zoological garden, founded by the London Zoological Society in 1828 at Regent's Park, was for instance celebrated with a descriptive book[221] and an analogous board-game[222], both published around 1830,[223] which took players by the hand in the discovery of many exotic and some local animals[224]. Descriptions and instructions in the joint booklet seem to suppose (or to assume) children were physically there. On square 5, for instance, they were told to "Stop four turns" in front of the "pleasing and picturesque building" of the Menagerie and "examine", among others, the puma, the jaguar, the porcupine and some monkeys.[225] Similarly, once arrived at the Water Fowl, "a circular pond with a grotto and *jeu d'eau* in the centre", the young boys and girls could "stop a turn" and feed the swans and ducks "with some bread or biscuit".[226] On the last square, the winner was invited to "visit the interesting collection of preserved animals at the Museum in Bruton Street".[227]

Other games confirm Wallis' ability and willingness to react to the transformation of people's interests, due to the continuous and fast evolution of science. Also around 1830, in the years when "chemistry became public culture",[228] as A. Nieto-Galan puts it, the question and answer game *Structure of the Earth* came out: these playing cards represent a splendid unicum, where the latest geological discoveries and theories, together with chemistry's principles applied to Earth sciences, are brilliantly presented. The "Game of Genius" also arrived on Wallis' shelves around 1830: here, the increased space accorded to the technological and scientific advancements is evident. Defined in the subtitle as a "Compendium of Inventions", this board-game offered players a journey through the opportunity to experience the most fundamental objects: from the hot-air balloon to the microscope, from the camera obscura to the steam vessel, from globes to barometers. Far from being solely objective descriptions, explanations and historical digressions, a moral value to each invention was also assigned in the booklet of instructions: so that players could go ahead if the invention was "good"; but they had to go back, stop for some turns or even start the game again if the invention was "bad", like gunpowder[229]or artillery.[230] Finally, around 1847, when Edward left the marketplace and John

[221]The author was said to be "a member of the University of Dublin". *A Stroll in the Gardens*, 1830 ca.

[222]WALLIS, *Amusement in the zoological garden: a new game*, [1830 ca].

[223]The book came out with no publishing date; nevertheless, it must have been ~~be~~ published after 1828, when the Zoological Garden was founded, and not later than 1831: on a sample preserved at the Toronto Public Library (Osborne Collection of Early Children's Books; digitalised version available at https://digitalarchive.tpl.ca/objects/328511/a-stroll-in-the-gardens-of-the-london-zoological-society--d), in fact, we read a dedication from an "affectionate aunt", dated 22 August 1831. A similar discourse may apply to the game.

[224] It is interesting to note that the Zoological Garden is generally claimed to have opened to visitors only in 1847; however, both the game and the book explicitly talked about "visitors". Moreover, illustrations depicted women with children looking at animals. Since ~~in~~ its early years, the Garden was apparently opened to the Zoological Society members only, one hypothesis may be that visitors were only people who were selected, invited or members' relatives; consequently, the game and the book too were probably addressed to the same public. XIXth century catalogues list several texts whose titles referred to a visit to Zoological Gardens at Regent's Park. However, contents were limited to describe and illustrate animals in general. In this regard, the book and the game by Wallis were very different; because they described and illustrated only the animals preserved at the Gardens; in addition, animals were depicted in cages and buildings reproduced as they effectively were.

[225]WALLIS, *Amusement in the zoological garden*, [1830 ca], p. 4.

[226] WALLIS, *Amusement in the zoological garden*, [1830 ca], p. 3.

[228]NIETO-GALAN, *Science in the Public Sphere*, 2016, p. 71.

[229] WALLIS, *The New Game of Genius*,[1830 ca], p.9.

[230] WALLIS, *The New Game of Genius*, [1830 ca], p. 6.

Passmore bought his stock,[231] the *Circle of Knowledge* saw the light: the game was a celebration of the latest discoveries and pieces of technology. After digressions about "Voltaic electricity"[232], chemistry in its (historical) relation with alchemy[233] and the telegraph[234], one of the last spaces was dedicated to the steam engine. Steam, it was said, "has worked such wonders, that we hardly dare look back to olden times" and the steam engine "had commenced to revolutionize the world".[235] In this new world, a place that once required a month to reach, could now "be reached in a few days".[236] The Industrial revolution was already taking place and, six years later, the first Great Exhibition, which took place in London, would celebrate it.

Given the close interrelation of these last board-games with the latest scientific developments and with the widespread culture of technological, economic progress, and given that such feelings invested Paris too, one may expect to find something similar in the French market, especially after the frequent exchanges which had taken place in the previous decades. On the contrary, none of these inventions[237] would find a place within French games, at least until the 1890s, when the board-game *Fin de Siécle* would compile a rich overview of the century's inventions.[238]

[Img 5] *Le Nouveau Jeu des Ballons Aérostatiques*. Source gallica.bnf.fr/BnF.

Only the hot-air balloon had been capable, already fifty years before, to become the subject of an aesthetically exquisite board-game, titled *Le nouveau Jeu des Ballons Aérostatiques*, published by Crepy – the same who had published the well-known *Jeu des Fortifications*, in 1751, and the *Nouveau Jeu de la Vie Humaine* in 1775 (later translated, as seen above, in English). Like the board-games edited by Basset, this one too can hardly be considered an instructive game; in all likelihood, it was addressed to a public of adults, or "à l'usage des esprits éléves", as specified by the subtitle, and was a valuable answer to the ever-growing interest for the hot-air balloons which invested Paris after the spectacular, public flights.[239] The board-game was in fact sold in 1784, only one year after the very first flights, which were recalled thanks to the wonderful illustrations faithfully depicting the different balloons and the captions which accompanied the images. Space 5, for instance, represented the Martial balloon, which had flown in September 1783 in front of the French Royal Court: its passengers were a rooster, a sheep and a duck. The use of animals was intended to prove that the ascension was not a danger for human passengers, who indeed joined the following flights, which are described in the game as well. The names of Jean-Pierre Blanchard and Jean-François Pilâtre de Rozier, for instance, are remembered. Information provided about the flights was limited to the date of the event, the place of departure, the arrival and the name of the balloons. Crepy attempted to capture the buyers' attention with a fashionable theme, which certainly dealt with science in public and in the *salons* in some way, but it seems that no educational aim was there. For instance, no insights about how the balloons function or

[231] Edward Wallis ceased the business in 1847, when Passmore took over his stock. See for instance NORCIA, *Gaming Empire*, 2019, p. 2 and p. 184, n.3.
[232] WALLIS, *The Circle of Knowledge*, [after 1847], p. 7.
[233] WALLIS, *The Circle of Knowledge*, [after 1847], p. 8-9.
[234] WALLIS, *The Circle of Knowledge*, [after 1847], p. 11.
[235] WALLIS, *The Circle of Knowledge*, [after 1847], p. 14.
[236] WALLIS, *The Circle of Knowledge*, [after 1847], p. 14.
[237] An exception is represented by the *Jeu de Chemin de Fer*, which was first published in Metz by Gangel (1855), a publisher of popular prints, and later re-edited several times. Nevertheless, none of these games provided any information about trains and railroads; the celebration and the explication of this technological achievement was all left to the images.
[238] This board-game was published in Paris by Saussine, who would create an impressive amount of games.
[239] See LYNN, *Popular science and public opinion*, 2006, p. 123-147.

the history of their invention were reported, as Wallis would do later on. Basically, the tendency is the same that can be observed in Basset's games.

5. Conclusions

In the *Avis* introducing his *Neuvieme Jeu de Cartes Historiques*, devoted to natural history, Jouy observed that instructive card games had obtained an extraordinary success, "depuis dix ans en France", but also "en Angleterre où ils ont été adoptés".[240] His words, which were referred to instructive games in general and not specifically to science-themed ones, further confirm the exchange between France and England, although they underline the forward direction only. These games, however, also took steps back in direction. Nevertheless, despite sharing some topics in common and despite both making use of the term "educational", English and French science-themed games probably had different scopes and addressed slightly different audiences.

The nature of English card and board-games was profoundly and authentically linked to their status of instructive tools, mainly adopted in domestic, private contexts where children could learn by amusement, as recommended by Comenius and Locke.[241] The joint booklets contained detailed explanations to be read aloud, which often seem to prevail on the fun part, because of their length and, sometimes, complexity. Moreover, scientific subjects were soon accompanied by moral teachings: not only animals, but also inventions and technological advancements were used to teach young players good and bad behaviour. The combination of morals and science was already evident, at least within the Wallises' catalogue, in the *New Game of Human Life*, where Newton, depicted as the Immortal Man, perfectly represented the interpenetration of the two to its maximum degree.

On the contrary, French games did not show, apart from *Le Nouveau Jeu de la Vie Humaine*, any interactions between science and morals; moreover, even the board-games which were catalogued as "educatif" were not educational -or, at least, not in the sense that "educational" was intended in London. No booklets accompanied the games, and therefore poor at teaching scientific notions or explaining complex contents. The only exception is represented by the card game created by the Abbé Paris: however, it must be noted that the game was initially published in the English context and translated into French some years later, in all likelihood because the abbé Paris desired it to be so. So that the editorial history is not comparable to those games published in Paris by Crepy and Basset.

Most certainly the publishers and their catalogues may be the key to explaining, at least partially, the peculiarities of the English and French board-games we have seen. It is sufficient to quickly look at their catalogues to ascertain that the games were inserted in very different corpus of items and that they reflected this difference. Wallis, but also other English publishers who proposed to their customers educational, science-themed board-games, were specialized in selling items for children, ranging from toys to dissected maps and books. So that their board-games aimed at responding to a specific request of educational tools to be used at school or, mainly, at home to instruct young boys and girls. As proof of this, as we have seen, the Wallises had a network of collaborators, which included some women engaged in teaching and science popularization; moreover, their games proved to be often inspired by educational theories of the time.

[240] JOUY, *Neuvième Jeu de Cartes Historiques*, 1808.

[241] The popular manual *Practical Education* (1798), by Maria Edgeworth and Richard Lovell Edgeworth, basically re-elaborated Comenius and Locke's theories. See KLEMANN, "The Matter of Moral Education", 2011, p. 226-229.

On the contrary, Crepy and Basset both came from families belonging to the famous "imagerie" of Rue Saint Jacques:[242] the street was so called because it was populated by shops of engravers and printers, who were the most known and appreciated in the French capital. Their board-games, indeed, were sold among prints of different kinds and prices, mainly devoid of any educational aims and certainly not specifically addressed to a juvenile public. Having said that, we may assume that their science-themed games met Parisians' taste for scientific knowledge and their widespread custom of devoting many sociable occasions to science, in the guise of spectacles or disquisitions. The adjective "instructif" used by Basset surely referred to a certain dimension of education;[243] nevertheless, the layout of the games itself, the brevity of the explanations and, at the same time, the beauty of the illustrations suggest a wider circulation and use, at least according to the publishers' intentions, than those which would derive from an exclusively young public.

The use of dice, in the French versions, and teetotum, in English ones, highlights this difference and underlines the point. Because of the explicit, immoral link between dice and hazardous games, the Wallises recommended players to use one or two teetotum and not to bring any dice at home. French samples, on the contrary, did not say anything about that: instructions mentioned dice and, even if we know that some games required the substitution of dice with a "cochonnet",[244] it was not the case of science-themed games. The diversity in material goes hand-in-hand with the diversity of the games' rules, which significantly affect the meaning and the message of the actual playing. French board-games did not shy away from the aleatory aspects: players simply rolled the dice and the squares informed them of the next move. Scientific images and topics thus coexisted with the shallow, an-end-in-itself nature of hazard and the playful, unfettered, contingent dimension prevailed. These characteristics, as well as the overall structure of the games, seem to indicate that these board-games were proposed as "rational pastimes", like, for example, electrical spectacles or recreational mathematics at the end of the XVIIIth century. Rather than educational instruments, they instead appear to be fashionable items which demonstrated people's desire to have fun in society in a noble, legitimate way.

Instead, English examples often overcame the chance, which ended in being submitted to players' knowledge. Many of the games we have seen, like the *Game of Genius*, the *Wonder of Art* or the *Science of Botany*, made the moves dependent on the players' capability to correctly answer the questions, thus proving to have learnt or to already know what they were supposed to. So that young boys and girls were taught that knowledge could prevail on hazard and could dominate it – at the same time, they had to recall it could not dominate Nature and its phenomena. A similar take-at-home message perfectly pictured the spirit of the emerging positivism: more than notions, it was important that children understood that scientific and technological knowledge were the right tools to rule the world. And goose, as well.

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[242] MILANO, "Imagerie Parisienne", 2008. See also GIRARD & QUETEL. *L'Histoire de France*, 1982, p. 15-20.

[243] Basset printed one of the several editions of the *Jeu des Fortifications*, which had a genuine, instructional aim. Nevertheless, science-themed games seem to differ from it.

[244] For instance, the game HAMEL, *Le Divertissement des Religieuses*, [1640 ca].

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