Peg solitaire : Contributions towards a historical update

John Beasley, 6 July 2013, latest revision 3 October 2014

Since *The Ins and Outs of Peg Solitaire* was written, my attention has been drawn, mainly by Dic Sonneveld, to several important early references, and some sections of *The Ins and Outs* (specifically, pages 3-7, 192-199, perhaps 107, and of course the bibliography) would now be written rather differently. What follows does not claim to be the last word on the subject, but it lists all the discoveries currently known to me and not in the original edition of *The Ins and Outs* (some of them are referred to on page 252 of the paperback edition). They are grouped under four headings: the early history of the game, the discovery of the "fundamental class" theory, early German material, and further material from late nineteenth-century France.

The early history of the game (revised 19 September 2014)

The passages in *Mercure Galant*, August and September 1697, are transcribed elsewhere on this site. They greatly clarify the initial development of the game, and had I known about them and their examples of play I would have written pages 3-7 and 192-194 of *The Ins and Outs* quite differently. Dic Sonneveld credits his knowledge of the August passage to Wikipedia, but he appears to have dug up the September material himself. These passages appear to be the source of the information given in the Berey engraving *Nouveau Jeu du Solitaire* which I mention on page 252 of the 1992 paperback edition of *The Ins and Outs* as appearing in Volume 2 of the *Musée rétrospectif de la classe 100 / Jeux* written by Henri d'Allemagne for the Paris Exhibition of 1900 (it is reproduced on page 154 thereof), and they add credence to the dates "1697" and "1698" apparently added in manuscript to the engravings *Madame la Princesse de Soubize, jouant au Jeu du Solitaire* by Berey, and *Dame de Qualité Joüant au Solitaire* by Trouvain, which are reproduced by d'Allemagne on his page 155. All these engravings appear to have been produced for sale as independent items.

Dic has drawn my attention to a manuscript entitled

Sixiesme Volume de l'Armorial général

Cotté B 4 ^{e}

Bourgogne Duché

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Généralité de Dijon

on page 718 of which is a shield, annotated "Jaque Chavillot, prètre habitué en l'Eglise Catédrale de S^t. Vincent de Chalon", showing what appears to be a 37-hole solitaire board with handle. The title page of the manuscript carries annotations "En Conséquence de l'Edit de Création de la Maitrise générale des Armoiries du mois du Novembre 1696. Ladite Création révoquée par Edit du mois d'Aoust 1700" at the top of the page and "dont je suis le Garde, en vertu d'un Arrest du Conseil du 12 février 1697. Et confirmé par l'Edit de suppression de l'an 1700" to the right of the title, the latter followed by a signature which Dic reads as "dhozier" and a date "Novembre 1711" (I have expanded several contractions in the original, I hope correctly). The subsequent volume comprises 1164 pages each with a column of five shields on the left and a note of the holder alongside (the last few pages just have a column of blank shields).

It appears from other sources that this was part of a census of French armorial bearings taken under the direction of Charles d'Hozier, "juge d'armes du royaume de France", whose clerks registered no fewer than 110,000 shields between 1696 and 1709 (this particular volume was presumably signed off in 1711). When and why Chavillot should have adopted a solitaire board as his armorial emblem is unclear (if indeed he did so - it is possible, though perhaps unlikely, that he was portraying a device of similar appearance used for some quite different purpose), but this is further evidence that solitaire was well established not later than 1709.

Those interested will find the relevant material at

http://gallica.bnf.fr/ark:/12148/bpt6k1111382/f2.item
http://gallica.bnf.fr/ark:/12148/bpt6k1111382/f721.item

(title page and page 718 respectively).

Dic has located the 1713 book by Rémond de Monmort which I mention on page 252 of the 1992 paperback edition of *The Ins and Outs*. It is *Essay d'analyse sur les jeux de hazard*, it appears to mention Solitaire only in a passing note on pages *xlj* and *xlij* of its "Avertissements" (its primary concern is with games of chance), and while it describes the game as having been all the rage in France some twelve or fifteen years previously, it adds

nothing to what we already know.

Dic has also drawn my attention to a book by de Bouis, *Le Nouveau Jeu du Solitaire, réduit en problêmes géometriques et en décorations enluminées*, Paris, 1753, and a Google search for "de bouis solitaire" produced a link

> http://books.google.co.uk/books?id=4FVeAAAAcAAJ&pg=PA11&lpg=PA11&dq=de+bouis+solitaire&
> source=bl&ots=OwicKJc4JU&sig=kMouogFdIuAExQv3PQS9v7e6gqQ&hl=en&sa=X&
> ei=bNQZVMiSEsTPaPKQgIgK&ved=0CCAQ6AEwAg#v=onepage&q=de%20bouis%20solitaire&f=false

(all on one line with no spaces) through which it could be downloaded. The book gives:
- a set of 21 problems in which the player has to reduce the number of pegs on the board to 21, 20, 19, ..., 1 in turn, no further play being possible in any case;
- some further problems including one in which the penultimate move removes nine men (as in one of the problems cited in *Mercure Galant*);
- a suggestion for the enrichment of the game by the use of colours;
- a brief discussion of "marked peg" problems, in which the player nominates the peg which is to be the last survivor (he appears to have freedom in the choice of the hole to be initially vacated).

It contains neither information nor speculation about the game's origins.

   The principal new material here appears to lie in the suggestions regarding the use of colours, which appear at least partially to anticipate the idea which John Maltby successfully patented over two hundred years later, and in the nomination of a marked peg to be the final survivor. Many of the problems were of course also new, but on the whole these do not strike me as being particularly interesting; the writer often contents himself with a final position having only lateral symmetry when one with rectangular or even square symmetry could have been reached (and in some cases had been reached in the problems in the letters to *Mercure Galant*). The section on marked men starts with a note that the writer didn't believe it possible to nominate either the centre peg or one of the pegs diagonally adjacent to it as the final survivor, but in fact all can be done though none is particularly easy.

   The book appears to have had little influence, but it should certainly be included in any future bibliography of the game. The publisher was Nyon.

In respect of the passing reference in a letter written by Horace Walpole in 1746, of which I took a very cautious view in *The Ins and Outs* fearing that it might have referred to a card game, David Parlett tells me that my fears were groundless: "Patience dates from the late eighteenth century, did not reach England until the nineteenth, and was not called Solitaire when it did" (*The Oxford History of Board Games*, OUP 1999, page 157). So the spread of our Solitaire to England by the middle of the eighteenth century can be taken as established.

Conspicuous by its continuing absence is any reference to the story of the prisoner in the Bastille, and I stand by what I wrote in issue 28 of *The Games and Puzzles Journal*: anyone who repeats this tale without citing a French source earlier than 1801 should regard himself as perpetuating myth rather than history. However, this does not imply any credence in the story of an American origin as given in *Mercure Galant* (and it will be noticed that the writer was by no means dogmatic about the matter - "On m'a dit que ... Il se peut que ... De quelque pays que soit cet Etranger"). I believe the truth to have been much more mundane: a board with this pattern of holes was already in use for some other purpose, and somebody noticed that it made a good puzzle. Who, we shall probably never know.

The development of the "fundamental class" theory (revised 12 July 2013)

Dic Sonneveld has drawn my attention to a paper *Essai sur quelques jeux de situation et principalement sur le Solitaire* by Vallot, held in the Bibliothèque municipale de Dijon "suivi d'une note de Cauchy" (MS 1490, Fol. 129), and to apparent mentions of it in the *Procès-verbaux des séances de l'Académie (Académie des sciences)*. A note for the meeting of 26 May 1817 records such a paper as having been received, and at the meeting of Monday 1 June 1818 Cauchy reported as follows (text defective at [...]):

   M. Cauchy, au nom d'une Commission, lit le rapport suivant sur une Notice adressée par **M. Vallot**, de Dijon, sur *Quelques jeux de situation* :
   « L'Académie nous a chargés, **M. Arago** et moi, de lui rendre compte d'une notice sur quelques jeux de situation, et en particulier sur le solitaire qui lui a été adressée par **M. Vallot**, Secrétaire de l'Académie des Sciences, Arts et Belles Lettres de Dijon. Dans cette notice, l'auteur commence par rappeler les noms des jeux de situation les plus remarquables et des auteurs qui en ont parlé. Il s'attache ensuite particulièrement au jeu du Solitaire, composé de fiches placées à égales distances

les unes des autres dans l'enceinte d'une figure telle qu'un carré, une croix ou un octogone, de manière de former des lignes qui se coupent à angles droits. En laissant vide la place de l'une de ces fiches, et enlevant successivement toutes les autres suiva[nt la] règle connue du jeu de Dames, on doit finir par ne laisser qu'une seule fiche sur la tablette. C'est un problème de situation dont on n'a pu donner jusqu'à présent que des solutions pratique obtenues par le tâtonnement. L'auteur désirerait qu'on essayât de le résoudre par la théorie; mais comme il ne présente aucune méthode pour y parvenir, et se contente d'offrir des solutions pratiques relatives à divers cas particuliers, il en résulte que son travail doit être uniquement considéré comme un renseignement utile à ceux qui se proposeraient de traiter de sembables questions. »

Signé à la minute: **Arago**, **Cauchy** Rapporteur.

L'Académie approuve le Rapport et en adopte les conclusions.

Nobody appears to have challenged this, so it would seem that the "fundamental class" property of solitaire was still undiscovered, or at least had not become widely known, as late as 1818. Elsewhere, Vallot reports Ampère as having played solitaire, but his reference (*Revue des deux mondes*, fourth series, volume 9, 1837, page 400) merely says that Ampère liked nothing more than to sit close to his fiancée "sous prétexte d'une partie de domino ou de solitaire", and he does not appear to have published anything on the game.

Dic has also drawn my attention to an article in *Revue de la Côte d'Or et de l'ancienne Bourgogne*, 1836, pages 45-58, which gives a report on the work of Suremain de Missery earlier than that which I cited in *The Ins and Outs*. Unfortunately this is merely a second-hand report and says less than the report which I cited in *The Ins and Outs*, but it does show de Missery's work to have been slightly earlier than I had considered myself entitled to assume. Sadly, his *Traité analytique du jeu de Solitaire* appears to have been lost.

So it would seem that this theory was discovered sometime between 1818 and 1836. Yet I continue to believe that de Missery cannot have been the first to have done so. As far back as August 1697, one of the letters to *Mercure Galant* reported that "On a voulu faire un essay de commencer par le Point fixe en le tirant du Jeu : & on cherche aussi de finir le Jeu par le Point fixe, mais on n'a point encore trouvé ces manieres, quoy qu'on y ait fait l'attention qu'on a à chercher la Quadrature du Cercle" ["People have tried to play by starting at the Central Point and removing this man from the board, and also to finish the Game at the Central Point, but nobody has yet found a method of doing these, even though they have given it as much attention as to the Squaring of the Circle"]. Are we really expected to believe that nobody sat down between 1697 and 1818 or later, and worked out why not?

Early German material (revised 3 October 2014)

Dic Sonneveld draws my attention to a mention of a "Capuzinerspiel" using 45 pegs on page 54 of *Das dreyseitige Schachbrett, oder, Art und weise: auf demselben sich Selbdritte zu unterhalten, aus dem Italiänischen mit verschiedene Hauptsätzen*, 1765. He also tells me that the *Oberdeutsche allgemeine Literaturzeitung* of 1804 mentions that the "Einsiedler- oder Kapuzinerspiel" usually had 44 pegs, and that an article "De Puzzle van Napoleon", in the issue of *Algemeen Handelsblad* for as late a date as 20 October 1928, again shows the 45-hole board. However, when faced with an isolated and anomalous item such as this last, one always wonders whether a non-playing writer has got the details wrong. More recently, Fred Horn has sent me a picture of a board of this size and shape which his grandfather had made, and which is item 18028 in the HONGS collection (Historisch Overzicht Nederlandse GezelschapsSpellen). He thinks it was made sometime in the late 1920s or early 1930s, and he is sure that his grandfather would have had something that served as an example. However, this board appears to have been a private construction for use at home, not a surviving instance of something which had been on general sale, and it is not clear whether it provides evidence that that the 45-hole board was in vogue in the Netherlands at the time, thus refuting my scepticism regarding the article in *Algemeen Handelsblad*, or whether the article itself had provided the example which his grandfather had copied.

Dic gives me a reference

http://books.google.nl/books?id=uqxAAAAAcAAJ

to the *Neueste Anweisung zum Kreuz-, Einsiedler- oder Kapuzinerspiel* of 1807, which is in my bibliography only as "cited by Ahrens". In fact it is a collection of positions with eightfold symmetry or four-fold rotational symmetry which can be reached from a position with only the central hole vacant, and on the 33-hole board it includes all such positions apart from 10.3, 10.107, and 10.121 in *The Ins and Outs* (so it does take over from the Crelle reference of 1852 as containing the earliest solution to the central game that I have seen). It also

includes four positions without solutions, and with a note which, if I have interpreted it correctly, suggests that they appear to be unreachable. Indeed they are all unreachable; three are not in the correct fundamental class (perhaps providing additional evidence that this theory was still unknown in 1807), and the fourth, requiring play to end with just d1/d3/a4/c4/d4/e4/g4/d5/d7 occupied, yields to analysis by Conway's balance sheet.

The book also contains some similar problems on the 37-hole board, and here there are ten positions given without solution. One is in fact reachable; of the rest, five are not in the correct fundamental class, two suffer from a shortage of the pegs needed to clear outside corners, and two yield to analysis by the 37-hole version of Conway's balance sheet (Figure 11.34 in *The Ins and Outs*).

Another reference from Dic is

http://books.google.nl/books?id=iadAAAAcAAJ

to an 1808 book *Der praktische Solitärspieler oder Anweisung das bekannte Kreuz- oder Kapuzinerspiel durch afgestellte Muster zu erlernen*. This contains an extensive set of single-vacancy single-survivor problems on the 33-hole board, mostly of the "marked man" kind with a specific peg nominated to be the final survivor. Among the problems are sets where the nominated survivor is required to make the *n*th move of the solution, *n* running from 1 to 7, but there appears to be no highlighting of "man on the watch" problems and no attempt to maximize the length of the final sweep.

In all the problems, the survivor finishes either in the initial vacancy or in a hole a multiple of three away from it, and in the problem "vacate d1, mark the man at d3" the marked man finishes at d7, but I am unable to read the accompanying text, and so cannot say whether he had an explicit proof that these were the only solvable cases or whether he was empirically confining his presentation to problems to which he had been able to find an answer.

The names "Kreuzspiel" and "Kapuzinerspiel" will be noted, and Bestelmeier's catalogue of 1803 uses "Nonnenspiel". It does indeed appear to have been the belief in Germany that the game was of monastic origin, and this opinion came to be shared by Vallot; Dic draws my attention to a passing remark on page 250 of his 1837 book *Icthyologie française*, in which he attributes the invention of Solitaire to monks wanting to while away their boredom, and to in an article in the 1842 volume of *Actes de l'Académie royale des sciences, belles lettres et arts de Dijon*, where he refers on page 7 to Solitaire as "ce jeu inventé par des religieux". However, the evidence for the 37-hole game, which has no even superficially religious connotations unless we count its appearance on the coat of arms of Jaque Chavillot, appears substantially to predate anything for the 33-hole game (a contrary statement, on page 48 of the 1836 *Revue de la Côte d'Or et de l'ancienne Bourgogne*, does not appear to be supported by any early source), and I regard the suggestion of a monastic origin as a red herring.

Further material from late nineteenth-century France (revised 12 September 2013)

A book listed in my bibliography only as "cited by Redon" is Deveau-Carlier's *Le Solitaire Amusant* (1884). In fact this appears to have gone through two editions in 1884 and at least one in 1885, each being larger than its predecessor, and Dic Sonneveld has sent me a scan of the third. This extends over 218 pages plus frontpapers, introduction, and endpapers, and gives the rules of the standard 37-hole board followed by 323 problems and solutions. Each problem specifies the hole or holes to be vacated initially and the target position, these being of various kinds: dominoes, punctuation marks, letters and digits, pairs of letters, short words, geometrical figures, architectural figures, figures relating to bridges and highways, geographical figures, figures connected with religion, and miscellaneous figures. No use is made of marked men.

Also brought to my attention by Dic is an important series of articles and problems by Paul Redon and others which appeared in *Les Tablettes du Chercheur* between 1891 and 1896 (for Internet links, see the detailed notes elsewhere on this site). In particular, all three of the problems given as unsolvable on page 198 of *The Ins and Outs* were so proved by Redon in analyses in this magazine: 15 March 1892, Hermary's 39-hole board, "vacate d1, finish at d7"; 1 April, same board, "vacate and finish at a4"; 1 May, 41-hole diamond board, "vacate c1, finish at e7". These analyses would certainly have been acknowledged in *The Ins and Outs* had I known about them at the time.

It is likely that T. R. Dawson used very similar arguments when developing his proof of the unsolvability of the double-vacancy problem "vacate b4/d4 and play to finish there" on the 33-hole board (see page 107 of *The Ins and Outs*), which raises the question: did he know of Redon's analyses? My guess is that he didn't; I think it unlikely that he had copies of a French periodical which had ceased publication when he was six years old and of which there can have been few copies in this country (the British Library does not appear to hold one), and what Redon could work out from scratch Dawson could have worked out also. But certainly the priority for analyses of this kind lies with Redon.

Envoi

This paper contains everything now known to me which, had I known about it when writing *The Ins and Outs*, would have caused me to write differently. I hope that any future writer on the history of peg solitaire will take account of these various points, unless of course they are invalidated by future discoveries or have already been invalidated by discoveries of which I am still unaware.