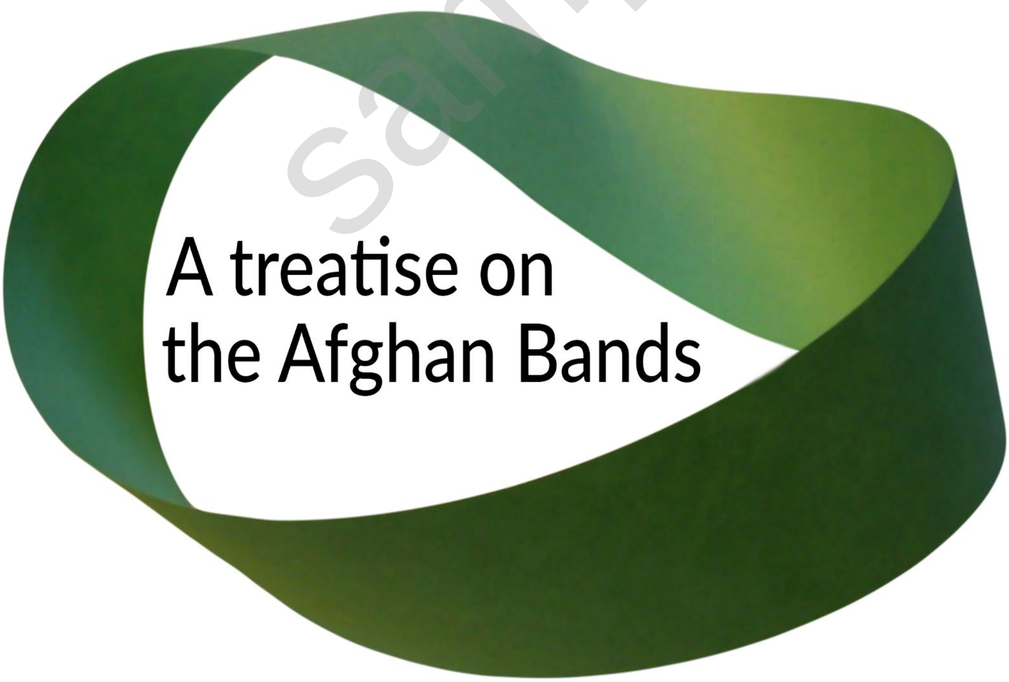
THE MÖBIUS STRIP IN MAGIC



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The Möbius Strip in Magic

A Treatise on the Afghan Bands

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Chapter 1

Introduction

The Afghan Bands are one of the most well-known magic tricks. Almost every instruction book for budding magicians describes how to perform it. The basic plot of this minor mystery is that the magician cuts a circular strip of paper lengthwise in half. Instead of producing the expected two separate rings, the magical version results in a band twice the size of the original. The magician repeats these actions and creates two linked rings or even a long loop with a knot.

Many magicians might not realise that this trick has an illustrious history and is not merely a feat for beginners. Harry Blackstone regularly performed the Afghan Bands, which he called the *Red Rags*, as a front curtain piece. Even the great Harry Houdini included a version of it in his matinee show. Although the Afghan Bands might not be a trick that blows the minds of the audience, it is nevertheless a minor mystery that can entertain them. The popularity of this trick has waxed and waned over the past century, and it is nowadays rarely studied or performed. This ebook tries to inspire magicians to include this quirky trick in their repertoire again.

The basic routine was introduced to English-speaking magicians in 1901 by Percy Selbit as the *Mystic Afghan Bands*. The origin of the name of this trick makes sense when placed in the cultural context of the start of the twentieth century. The name Afghan Bands points to a time when the Western world associated Afghanistan with mystical forces, instead of with war and terrorism. From Alexander the Great to the Hippie Trail, Europeans have long been fascinated with Afghanistan, India and other parts of the subcontinent. When Selbit first published this trick, Afghanistan formed part of the British Raj, which attracted many adventurers. Rudyard Kipling's novella *The Man Who Would be King* (1888) is a tale of two such English adventurers who travel to Kafiristan, in present-day Afghanistan. The land is desolate and harsh, but it hides esoteric secrets as they encounter a tribe that practices Masonic rituals. Also in real life, adventurers journeyed to these faraway lands in search of fakirs and mystics who perform mysteries such as the elusive *Indian Rope Trick*. These mystical connotations with Afghanistan inspired the name Afghan Bands. Although magic shops have released this trick under many names, most versions retain its relationship with the Orient, and the Afghan Bands has become a recognised name in the history of magic.

The method for this trick is based on the science of topology, which is the systematic study of shapes. German mathematical genius August Ferdinand Möbius and Johann Listing simultaneously discovered the mathematical principle behind the Afghan Bands in 1858. This shape was eventually named after one of its discoverers and the Möbius Strip (also Moebius or Mobius Strip), is a surface with counter-intuitive properties that are ideal to be used as a principle in theatrical magic.

Not only mathematicians and magicians have studied the Möbius strip, but it has also been the subject of practical applications such as games, electronics, cosmology and nano-technology. The surprising topological properties of this shape have inspired authors, composers and visual artists.

This ebook is based on a systematic review of the magic literature, using the extensive resources of the Conjuring Arts Research Center. Their online library yielded more than a thousand documents, of which more than a third consisted of issues of the *Linking Ring*. The majority of these references relate to reports of magic club meetings where somebody performed this trick. Martin Gardner wrote the first overview of the Afghan

Chapter 2

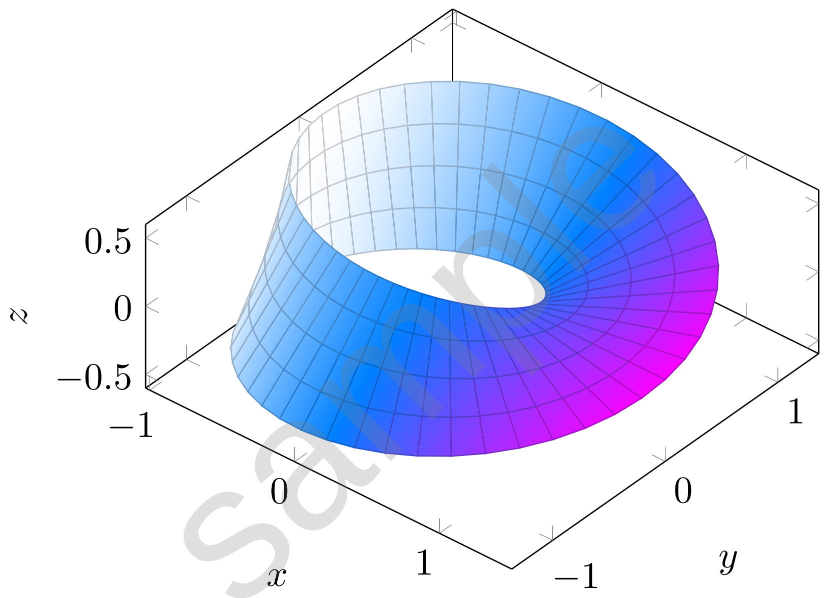
The Möbius Strip

Mathematics is arguably the one science that influences our lives more than any other field of academia. We are surrounded by the products of engineering, which could not exist without mathematics. Not only is mathematics a practical science, but it is also used to create works of art. Music, painting, sculpture and magic are expressions of art where mathematics plays a significant role. Magic and math are intimately related as many so-called 'self-working' tricks are based on procedures that can be described mathematically.

Although mathematics is the ultimate application of rational logic, for most people, the science of mathematics is closer to magic than it is to science. Mathematicians use theorems expressed in complex formulas with esoteric symbols that are closer to magical incantations than to logic. To the uninitiated reader, these three formulas are gibberish, but to a mathematician, these symbols describe the geometry of a Möbius strip with a radius of R.

$$f(x,y,z) = \begin{cases} x(u,v) = (R + \frac{v}{2}\cos\frac{u}{2})\cos u & : 0 \le u \le 2\pi \\ y(u,v) = (R + \frac{v}{2}\cos\frac{u}{2})\sin u & : -1 \le v \le 1 \\ z(u,v) = \frac{v}{2}\sin\frac{u}{2} & \end{cases}$$

This chapter discusses the scientific, practical and artistic dimensions of the Möbius strip and describes some variations of how this principle can be used as an entertaining science demonstration. This chapter only provides a glimpse into the topsy-turvy world of the Möbius strip. Clifford A. Pickover, a prolific author of books on science, has written the most comprehensive work on the Möbius strip in existence. His 244-page book describes the rings in considerable detail with many delightful excursions into scientific and artistic concepts.



Visualisation of the Möbius Ring parametric equations with radius $R = 1$.

Parallel discoveries

What we now know as the Möbius strip originated from a theorem proposed by Swiss maths genius Leonard Euler. He developed a deceivingly simple rule about the relationship between the number of corners, edges and surfaces of solids such as cubes, pyramids, tetrahedrons and so on. Euler did not provide any proof for his theorem, which motivated many mathematicians to investigate it in more detail. The craft and science

Chapter 3

The Afghan Bands

Experimenting with Möbius geometry is an entertaining activity, but it cannot be classified as theatrical magic without a meaningful presentation. These parlour experiments are entertaining for the person conducting them, but not so much for the spectators. The procedure described in science books are boring to watch because there is no context beyond the method, the cutting process takes a long time, and the curly paper strips signal the technique.

Magicians have proposed many ways mitigate these issues and convert this mathematical curiosity to theatrical magic. Since the start of the twentieth century, magicians have developed various versions of this magic trick, introducing innovative methods and entertaining presentations to add layers of deception and dramatic qualities to the science experiment.

Topology can be both a plot and a method for magicians. As a magical plot, Lubor Fiedler's *Gozinta Boxes* has a topological theme, but it does not use topology as a method to create the illusion of magic. Magic tricks that use topology as a method are quite rare. Some notable examples are Bob Neale's Trapdoor Card and Cardwarp by Roy Walton. The Afghan Bands are the purest form of this kind of magic as the Möbius Strip is both studied by mathematicians and magicians, both the effect and the method are topological.

This chapter describes the historical development of the various methods and presentations magicians use to convert the Möbius ring into a piece of performance magic. The history of the Afghan Bands is a story of technical innovation but also of conflict over intellectual property. The history of the Afghan Bands provides an intriguing insight into how magic tricks originate, evolve and disappear over time.

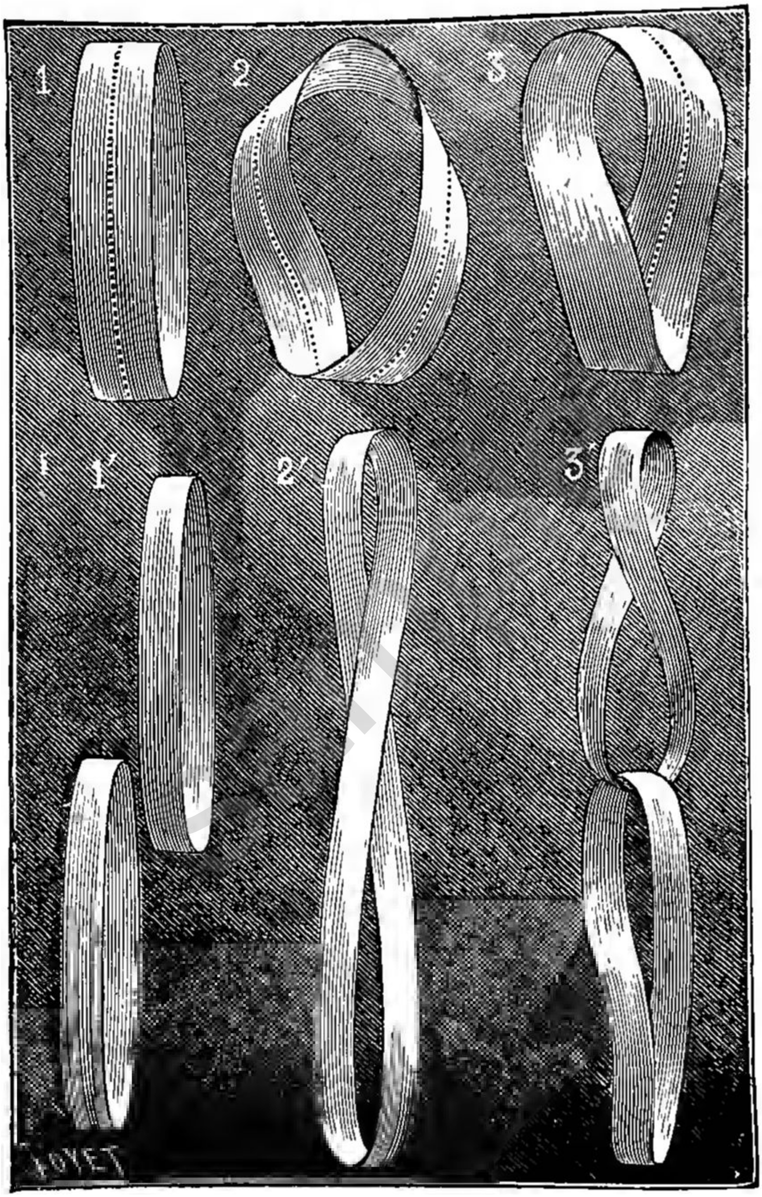
The history of the Afghan Bands

The Victorian era was a time of fast-paced scientific discoveries. Conducting experiments in the home became a favourite activity. Authors wrote books on the fascinating developments of science and described how the reader could experience the inherent magic of the natural world by conducting experiments in their living room. In those days, magic and science were close, and several magicians donned the self-styled title of professor of amusing physics.

The Möbius ring was published as entertainment for the first time by French aviator Gaston Tissandier. He was famous for escaping Paris with a hot-air balloon during the Franco-Prussian war in 1870. In another adventure, he rose to such heights that two of his companions died of altitude sickness. Tissandier also wrote a series of popular science books. His 1881 book *Les Recreations Scientifique* describes the Möbius rings as a form of scientific entertainment. Henry Firth translated Tissandier's book in 1890 and brought the Möbius ring to the attention of the English-speaking world.

The early history

The Möbius Strip became theatrical magic when French vaudeville artist Félicien Trewey performed it to amuse spectators. Trewey was one of the most talented people in vaudeville of the late nineteenth century, known for his hand shadows and chapeaugraphy. Trewey created twenty-five different hats from a simple ring-shaped piece of felt. He was so well known for this skill that it was also known as Treweyism.



The Paper Rings (Tissandier, *Scientific Amusements*, 1890).

Chapter 4

Playing with the Afghan Bands

The Möbius strip is not only a fascinating concept to study theoretically or to use as inspiration for art, but it is also fun to play with the many possibilities, using some strips of paper, a pair of scissors and sticky tape. This chapter describes some of the variations of paper and cloth Möbius strips and explains how to create and use Afghan Zippers.

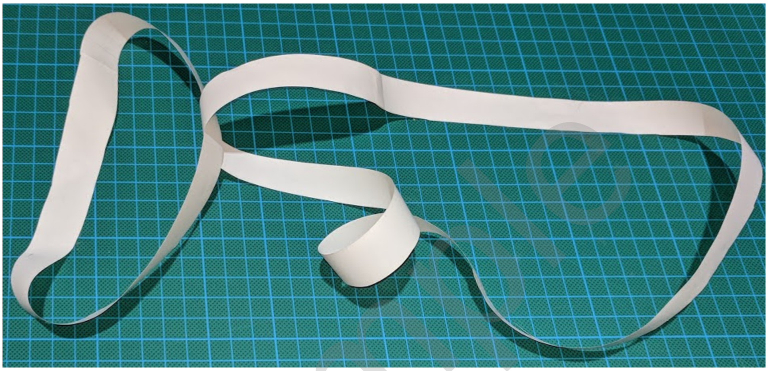
Paper Bands

The easiest way to create the various versions of paper Möbius rings is to use rolls of thermal paper commonly used in cash registers. To play with the basic Möbius ring principle, create a loop from a strip of paper about 300mm (1 ft) long by sticking the ends together with tape. When you cut the ring lengthwise in half, you are naturally left with two separate rings.

The magic starts when you create a ring and rotate one end half a turn before sticking the ends together. When you cut this strip in half, it becomes one long strip with two full twists. We can take this principle a step further by rotating one end twice before sticking the ring together. Cutting this strip in half results in two interlocked rings, each with one full twist. You can take it to the next level and twist the ring three times.

When you now cut it in half, the result will be a long loop with a knot in it.

Things become even stranger when you cut a Möbius strip in three equal sections. Start cutting one-third from the end and keep cutting till you return to the starting point. When you finish, you will have a small Möbius ring, linked to a double-sized loop. The possibilities are effectively endless, but the more twists you make in the first ring, the more tangled the resulting paradromic rings will be.



Slicing Möbius strip in thirds.

Möbius hearts

Many other variations of slicing paper rings have been published in popular mathematics books over the years. One option is to take two paper rings and glue them together before slicing them in half. Gene Anderson and mathematician Tadashi Tokieda published a range of variations of combining paper strips in the *Journal of magic Research.*

When you take two paper strips without a loop and glue them on top of each other at a ninety-degree angle and slice them in half, the result will be a square. The results become more interesting when we add some Möbius geometry to the process.

Create two Möbius strips, each with half a twist, one clockwise and the other twisted counterclockwise. Stick the two strips on top of each

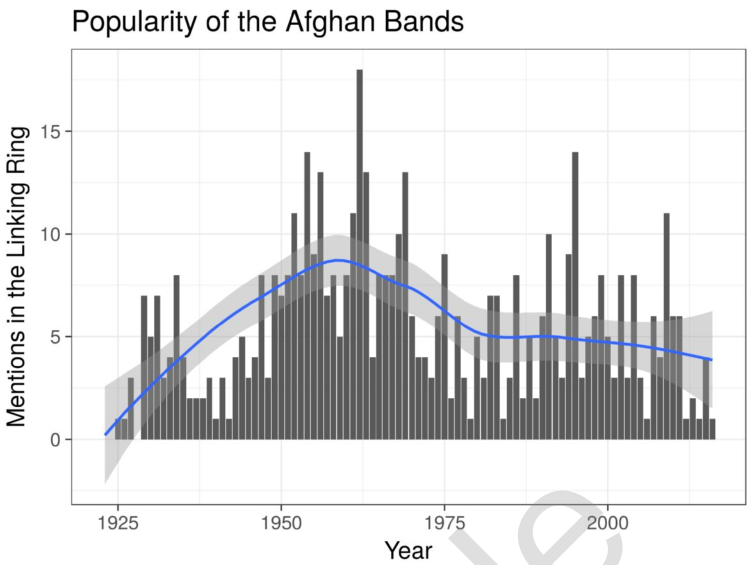
Chapter 5

In Closing

The waxing and waning popularity of this trick over the past century demonstrates the evolution of fashion in magic. A fashion is a development that gains popularity quickly, after which attention slowly fades out. The slow progress of fashion contrasts with a style, which appears and reappears at regular intervals. A fashion is different to a fad which vanishes as quickly as it comes into existence. Examples of styles in magic are possibly the cups and balls or linking rings. The number of fads in magic is very high, given that most of the new tricks don't remain on the market for very long. The Afghan Bands are a classic of magic because it was popular for so long that it has become part of the collective memory of magicians.

The popularity of the Afghan Bands can be visualised by the number of times it was mentioned in the *Linking Ring* each year. The popularity of the trick grew until the 1950s after which it slowly withered away. The introduction of zippers briefly reinvigorated attention for this trick, due to regular advertising by Klamm Magic. Its popularity in the twenty-first century is very low. Magicians are spoiled for choice when it comes to choosing tricks to perform.

The invention of the Möbius strip and subsequent development of the many versions of the Afghan Bands show an interesting resemblance. Both the mathematical principle and its use in magic are examples of



Mentions of the Afghan Bands in the Linking Ring.

simultaneous discovery. August Möbius and Johann Listing almost simultaneously discovered the one-sided surface. This simultaneous invention is not coincidental because both mathematicians were pioneers in the new field of topology. Grappling the Euler characteristics of objects it was almost inevitable that they would stumble on the one-sided surface. Multiple discoveries occur in science with great regularity.

The evolution of the Afghan Bands is steeped in controversy over intellectual property. Are these stories of malicious intent, or are these controversies examples of simultaneous discovery? The possibility of concurrent development was never mentioned in the literature as magicians were quick to accuse each other of plagiarism, which is the second worst transgressions a magician can commit, only second to exposure of secrets.

Presenting the trick as a paper race is credited to Foxwell, but can be found in the literature as early as 1912. Did Foxwell read the *Magic Mirror* in 1912 and plagiarise the idea from Australian magician Jean Hugard, or was it a case of simultaneous invention? The paper race idea

Bibliography

Adair, I. (1991). Bands Together. *Magigram*, 23(11):557–559.

Anderson, G. and Marshall, F. I. (1968). *Newspaper Magic*. Magic Inc., Chicago, IL, 10 edition.

Anderson, G. and Tokieda, T. (2015). Squares, Hearts and Möbius. *Journal of Magic Research*, (7):5–8.

Barber, W. (1965). The prevailing female fashion. *M-U-M*, 54(12):625.

Beal, T. (1921). The Debur Afghan Bands. In Naldrett, P., editor, *More Collected Magic*, pages 31–32. Percy Naldrett, Portsmouth.

Bertol, L. (1966). This is old!!! *The Linking Ring*, 46(1):56–57.

Blood, S. (1982). Society Reports. *Abracadabra*, 74(1919):532.

Blood, S. (1987). Tricks and Stunts for Christmas. *Magic Circular*, 81(14):45.

Christopher, M. (1946). The Afghan Bands — The Mobius Strip. *Hugard's Magic Monthly*, 3(8):524–526; 536; 571; 587.

Clarke, S. W. (2001). Magic books. In *The Annals of Conjuring*, pages 123–124. The Miracle Factory, Seattle, Washington. Originally Published in The Magic Wand (1923-1928).

Coleman. Hilo Hawaiian Bands. A brand new version of an old effect.

Conrad, G. (1938). Paging the Ladies: A New Use for Afghan Bands. *Genii*, 2(9):321.

Cramer, S. (2002). Remarkable evolution of the Afghan Bands. In *Germain the Wizard*. The Miracle Factory, Seattle.

Dalal, S. (1973). Presentation for the Afghan Bands. *Swami*, (18).

Dayton, R. (1986). *The Whole Art of Clippo*. Hades Publications.

de Muth, F. (1971). The Siamese matrimonial bands patter for Afghan bands.

The Linking Ring, 15(12).

Debur, P. (1923). The Afghan Bands with Debur Improvement. *Conjurer*, 4(29):156.

Demuth, F. (1923). How to conceal the twist in the Afghan bands. *The Sphinx*, 22(1):21.

Eckl, E. (1977). Gardyloo. Ed Eckl's First Lecture Notes.

Enright, D. (2005). Shadowland. Princess Lotus Blossom's Afghan Bands. *M-U-M*, 94(10):43;53.

Ervin, E. (1923). A variation of the Afghan bands. *The Sphinx*, 22(3):87.

Fleckenstein, J. (1947). Patter for Afghan Bands used by Flecky. *The Linking Ring*, 27(2):43–44.

Frankel, E. T. (1944). Loop of surprising length. *The Linking Ring*, 24(1):40–.

Galeza, C. (1940). Paper Magic. *Tops*, 5:28–29.

Gardner, C. (1963). Another mile along the highway of magic. *The Linking Ring*, 43(12):60–61; 132.

Gardner, M. (1949). The Afghan Bands. *Hugard's Magic Monthly*, 7(1):615.

Gardner, M. (1956). *Mathematics, Magic and Mystery*. Dover Books, New York.

Gardner, M. (1988). *Hexaflexagons and other mathematical diversions: the first Scientific American book of puzzles & games*. University of Chicago Press, Chicago.

Gardner, M. (1989). *Mathematical Magic Show*. Mathematical Association of America, Washington, D.C.

Gibson, W. B. (1930). Houdini's Afghan Bands. In *Houdini's escapes and magic*, pages 128–132. Blue Ribbon Books.

Ginn, D. (1986). Entertaining children with magic. *M-U-M*, 76(1):16–17.

Grant, U. (1927). Club performers read this—Grant's patter for the Afghan Bands. *The Sphinx*, 26(6):472.

Guest, L. P. (1959). James C. Wobensmith. Magician of the month. *M-U-M*, 49(10):448–449.

Hagan, D. (1956). Afghan Bands. In *Christmas Magic*, page 24. Ireland Magic Company, Chicago.

Harris, V. S. (1955). Patter for the Afghan Bands. *The Linking Ring*, 37(7):65–66.

Hatton, H. and Plate, A. (1910). The Afghan Bands. In *Magicians' Tricks: How They Are Done*, pages 306–309. The Century Co., New York.

Hilliar, W. J. (1902). The Mystic Afghan Bands. In *Modern Magicians' Hand Book*, pages 289–290. Frederick J. Drake & Co., Chicago.

Hoffman, P. (1904). The Afghan Bands. In *Later Magic*, pages 471–473. E.P. Putton. George Routledge & Sons, New York and London.

Houghton, N. (1952). Afghan Band Aid. *The Linking Ring*, 32(6):79.

Hugard, J. (1912). The Afghan Bands: A Comedy Setting. *The Magic Mirror*, 4(9):96.

Jones, L. E. (1943). Triumph of the Democracies. *The Bat*, 2:1; 11.

Kelley, D. M. (1947). Patter for the Afghan Bands. In Jones, L. E., editor, *Meet the Boys of the Pacific Coast*, page 26. Walter Adrian, Portland, Oregon.

Kennealy, J. (1941). Afghan Bands - Delayed Linking. *Tops*, 6:30.

Korim, F. (1969). The Afghan Bands Revised and Restyled. *Genii*, 33(9).

Kosinoff, B. (1931). Poetic patter. *The Sphinx*, 29(11):472.

Larsen, W. and Wright, T. P. (1928). At the Circus. In *The L.W. Mysteries for Children*, page 10.

Larsen, W. W. S. (1936). Special Announcements: Plagiarism. *Genii*, 1(2):6.

le Rossignol, J. (1958). The Afghan Bands—A Novel Twist? *The Magic Circular*, 53(589):60.

Lekelis, P. A. (2014). A Topological Trio.

Leroy, A. (1945). It is an unusual universe. In *Magic From A 2 Z*, page 24. Frank Ducrôt.

Linsie, J. B. (1967). The Afghan Runaround. *Magigram*, 1(8):557–559.

Lippy, J. D. (1930). Burning Bands. In *Chemical Magic*, pages 29–30. A. L. Burt Company.

Logan, B. (1980). The Rice Meter. *The Linking Ring*, 60(4).

Lopez, B. (1958). Magical therapy. *M-U-M*, 48(10):402–404.

Marcus, P. (1967). Pages from my Notebook. *Magicana*, 15(85):11.

Mardo, S. (1947). Uncanny Rags. In *The Hands Only*, pages 11–13. Lloyd E. Jones, Oakland.

Marshall, F. I. (1962). The Afghan Bands. *The Linking Ring*, 42(11):95–96.

Mayne, A. (2015). Mobius Ring. In *Magic & Mischief*. CreateSpace Independent Publishing Platform.

McAthy, G. (1947). Patter for the Afghan Bands. In *Smart Tricks For Magicians & MC's*, page 10. Tommy Windsor Studio, Marietta, Ohio.

McKay, W. (1984). The Dilemma & Arithmetic. *The Linking Ring*, 64(1):51–52.

McKeever, H. I. (1965). Those Afghan Bands. *M-U-M*, 55(1):32.

Merlini, J. (1953). Spectator's choice. *Abracadabra*, 16(391):192–203.

Nelson, J. M. (1926). The Three Links. *The Sphinx*, 25(10):290.

Nightingale, J. (1956). Revising an oldie. *The Magic Circular*, 51(566):67.

O'Dell, D. (1941). Patter for Afghan Bands. *Tops*, 6:15.

O'Dell, D. (1966). Patter for Afghan Bands. *New Tops*, 6:20.

Olson, R. E. (1966). An Illustration for Eternity. *New Tops*, 6:28.

Orben, R. (1950). Results of Genii-Orben Poll. *Genii*, 15(1):196–198.

Pickover, C. A. (2006). *The Möbius Strip: Dr. August Möbius's Marvelous Band in Mathematics, Games, Literature, Art, Technology, and Cosmology*. Thunder's Mouth Press, New York.

Poinc, E. (2007). Out of my mind. *The Linking Ring*, 87(2):60–61.

Potter, J. (1949). Black Light. Ultra violet rays in service of the magician. *Abracadabra*, 8(183).

Potter, J. and Grimes, L. (1949). The Paper Chain. *The Magic Wand*, 38(223):129–134.

Rice, H. R. (1932). My pet effects. *The Linking Ring*, 12(10).

Rice, H. R. (1937). My pet effects. *The Linking Ring*, 17(1):50–53.

Rigney, F. J. (1951). A new twist to an old twist. *The Linking Ring*, 31(2):73–75.

Selbit (1901). The Mystic Afghan Bands. In *The magician's handbook A Complete Encyclopedia of the Magic Art for Professional and Amateur Entertainers*, page 62. Marshall & Brookes, London.

Shortt, C. (1913). The Mysterious Afghan Bands. *The Magic Wand*, 3(33):524–526; 536; 571; 587.

Simms, W. E. (1948). Circus Bands. *The Conjurors' Magazine*, 4(1):11.

Singmaster, D. (2015). Möbius Strip. In *Sources in Recreational Mathematics*, pages 280–283. David Singmaster, 9th edition.

Smith, H. (1988). Gospel application for the Afghan Bands. *Magigram*, 21(1):31.

Smith, W. S. (1941). The Belt of Fidget the Fixer. *Genii*, 5(10).

Staar, W. (1974). Lets all buckle up! *The Linking Ring*, 54(11):68–69.

Stanley, G. (1927). A new wrinkle in the Afghan Bands. *The Linking Ring*, 7(3):687.

Stanyon, E. (1903). Erratic Paper Bands. *Stanyon's Magic*, 4(2):21.

Stanyon, E. (1930). The Remarkable Evolution of the Afghan Bands.

Tarbell, H. (1926). King Solomon's marriage bands. In *Tarbell system incorporated magic*, number 20, pages 9–11. Tarbel System Inc, Chicago.

Teller and Carr, T. (2005). The mystic circle and the invisibles. In *House of Mystery: The Magic Science of David P. Abbott. The Book of Mysteries*, volume 2. The Miracle Factory, Seattle.

Thomas, K. (1968). A new presentation for yogi improved Afghan bands. *The Linking Ring*, 48(11):72.

Thompson, T. (1950). Afghan Bands. *Genii*, 14(6):9.

Tissandier, G. (1890). The Paper Rings. In *Scientific Amusements*, pages 127–128. Ward, Lock & Co., London, New York and Melbourne.

Turner, R. (2010). Old McDonald's Belts. *The Linking Ring*, 90(12):92–94.

Vincent, L. (1947). The Afghan Races. *The Magic Wand*, 36(213-216):166–168.

Waller, C. (1923). The Afghan Bands. In *For Magicians Only*, pages 29–30. F.G. Tayer, Los Angeles.

Ward, G. (1994). The story of the Afghan Bands. *The Linking Ring*, 74(4):60–61.

West, A. N. (1922). The Afghan Bands with Only One Band. *The Magician Monthly*, 18(9):104–105.

Whaley, B. (2007). *The Encyclopedic Dictionary of Magic*. Lybrary.com, 3rd edition.

Widger, E. D. (1978). Sweet Out of Cotton Wool. *The Magic Circular*, 72(768):67–68.

Wiltshire, N. (1969). Afghan Bands Competition. *Gen*, 25:136.

Wobensmith, J. C. (1923). The Red Muslin Band Trick. *The Magic World*, 7(1):68–69.

Wobensmith, J. C. (1930). The Protection of Magical Ideas. *The Sphinx*, 29(7):277–278.

Wrest, E. (1915). The Afghan Bands. A New Way of Doing an Old Trick. *The Magician Monthly*, 11(5):77.

Wright, E. O. (1964). Analysis of the total number of twists resulting from cutting any order Moebius Bands with any number of cuts. *Transactions of the Kansas Academy of Science*, 67(2):391–404.

Zmeck, J. (1964). Hätte Möbius das geahnt? *Magische Welt*, 13(1;2):10–14;50–53.