

Shahar Arzy, Moshe Idel,  
Theodor Landis & Olaf Blanke

## *Speaking With One's Self*

*Autoscopic Phenomena in Writings  
from the Ecstatic Kabbalah*

**Abstract:** *Immediate experience localizes the self within the limits of the physical body. This spatial unity has been challenged by philosophical and mystical traditions aimed to isolate concepts of mind and body. A more direct challenge of the spatial unity comes from a well-defined group of experiences called 'autoscopic phenomena' (AP), in which the subject has the impression of seeing a second own body in an extrapersonal space. AP are known to occur in most human cultures and have been described in healthy, as well as neurological and psychiatric populations. In this article we investigated the phenomenology of AP as described in the writings of the ecstatic Kabbalah of the thirteenth century, and searched for similarities and differences with respect to AP from these and other populations. The article discusses potential common research areas between cognitive science and the science of religious experience.*

**Key words:** autoscopic phenomena, ecstatic Kabbalah, neurology, phenomenology, mystical experience, temporo-parietal junction.

### **I: Introduction**

Autoscopic phenomena (AP) are defined as illusory visual experiences during which the subject has the impression of seeing a second own body in an extrapersonal space (Devinsky *et al.*, 1989; Brugger *et al.*, 1997). During some AP a fundamental component of the self is isolated, as the self experiences itself beyond the corporeal boundaries. Thus, it has been argued that the investigation of AP is a valuable tool in the scientific study of the self (Blackmore, 1982; Irwin, 1985; Blanke *et al.*, 2004; Blanke & Arzy, 2005). Moreover, Metzinger

Correspondence:

Shahar Arzy, Laboratory of Cognitive Neuroscience, Brain-Mind Institute, Ecole Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland. Email: shahar.arzy@epfl.ch

(2005) suggests that philosophy and folk-psychology include AP in their definition and exploration of the self, as well as in the creation of theories concerning the interactions between body–soul and brain–mind (see also Rank, 1925; Sheils, 1978; Metzinger, 2003). However, AP are rarely discussed in the neuroscientific literature, though they have long fascinated writers and physicians (for review see: Dening & Berrios, 1994).

Another approach that may further our understanding of AP and self may be the detailed analysis of mystical experiences. The person's body and self have a prominent role in mysticism (Idel, 1990; Hollenback, 1996; Forman, 1998). For example, mystical experiences may be characterized by feelings of expanding one's body beyond its physical limits; feelings of forgetting one's own body; or sensing 'something' filling the body (Idel, 1988; 1990; Forman, 1998). In other instances, the self is perceived as semi-permeable, while others have reported a unity between self and object; splitting of the self; or experienced themselves in bizarre positions (Forman, 1998). Forman claims that mystical experience facilitates a direct approach in understanding such phenomena. These, in turn, may teach us relevant characteristics about the relations between mind and consciousness, found usually within complex mental activities and perceptions. Although Forman (1998) emphasizes the value of meditation techniques and *non-ecstatic* mysticism, others suggest the importance of *ecstatic* mysticism for a better understanding of consciousness (see Appendix A). Thus, Hollenback (1996) understands the term 'ex-tasis' as an 'out-of-body experiences', which include a variety of phenomena such as AP (see below), 'journey of the soul' (i.e. experience of leaving the body, paralysed or asleep, with paranormal experience of encountering 'heavenly entities') and unio-mystica. (i.e. experience of unification with the divine) (Idel, 1990).

The present paper will discuss one group of these phenomena, namely voluntarily induced AP in a mystical trend of the Jewish Kabbalah of the thirteenth century. These mystics induced AP by using a specific technique as described previously (Idel, 1988; 1989; 2001). It is hoped that our analysis will clarify the following points: First, deciding whether AP were involved in the ecstatic Kabbalah, and if so, which one. Second, to compare their AP with those experienced amongst contemporary healthy subjects, as well as brain damaged patients. Third, to further our understanding of AP and self models. Fourth, to shed light on the historical evolution in understanding 'self' (Metzinger, 2005). A final point concerns the scholarship of mysticism: the comprehension of different experiences of revelation with respect to known neurological phenomena may help in understanding mechanisms of religious experiences and vice versa.

## II: Autoscopic Phenomena

Three distinct forms of autoscopic phenomena have been defined (see figure 1):

- (1) Autoscopic hallucination (AH): the experience of seeing a 'double' of oneself in extrapersonal space viewed from the perspective of one's own physical body, i.e. in AH the subject feels his 'self' or centre of awareness within

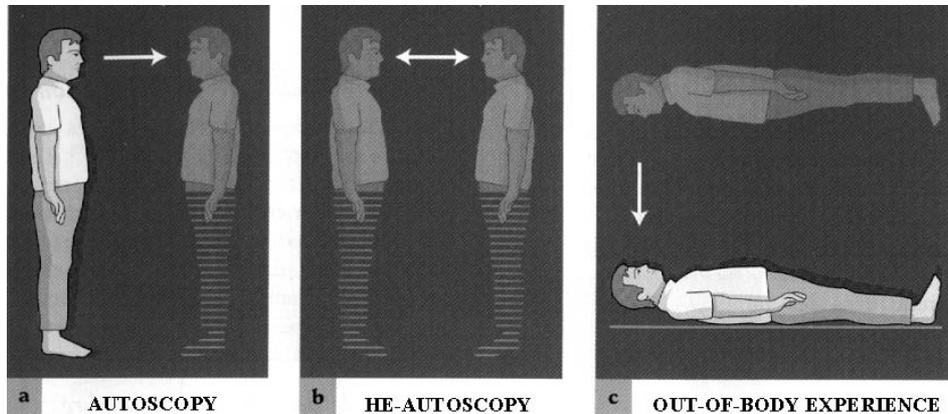


Figure 1. Phenomenology of Autoscopic Phenomena (AP)

Figure 1a. **Autoscopic hallucination:** experience of seeing one's body in extracorporeal space (as a double) without disembodiment (experiencing the self as localized outside one's physical body boundaries). The double (right figure) is seen from the habitual egocentric visuo-spatial perspective (left figure).

Figure 1b. **Heautoscopy:** an intermediate form between AH and OBE; the subject experiences seeing his body and the world in an alternating or simultaneous fashion from an extracorporeal and his bodily visuo-spatial perspective; often it is difficult for the subject to decide whether the self is localized in the double or in one's own body.

Figure 1c. **OBE:** During an OBE the subject appears to 'see' himself (bottom figure) and the world from a location above his physical body (extracorporeal location and visuo-spatial perspective; top figure). The self is localized outside one's physical body (disembodiment).

The directions of the subject's visuo-spatial perspective during the AP are indicated by the arrows (modified from Blanke, 2004a).

the physical body (Denning and Berrios, 1994; Brugger *et al.*, 1997; Blanke *et al.*, 2004).<sup>1</sup>

- (2) Out-of-body experience (OBE): people are awake and feel their centre of awareness as located outside their physical body. The subjects 'see' their body and the world from an elevated extrapersonal location, resulted in perceptions which are organized consistently with this visuo-spatial perspective (Lukianowicz, 1958; Grüsser & Landis, 1991; Blanke *et al.*, 2004).
- (3) Heautoscopy (HAS): an intermediate form between AH and OBE. During HAS subjects also see their double in extrapersonal space; although it may be difficult for the subjects to decide whether they are disembodied and whether the self is localized in the physical or the double's body. In addition, subjects may experience the world from two simultaneous or alternating visuo-spatial perspectives: the habitual physical visuo-spatial perspective and the extracorporeal one (Brugger *et al.*, 1994; Blanke *et al.*, 2004).

[1] Denning & Berrios distinguished between AH and OBE as did Devinsky *et al.* (1989); Older authors like Menninger-Lerchenthal (1935) and Hécaen & Ajuriaguerra (1952) only distinguished between AH and HAS.

AP are mainly described visually (leading probably to their name), though not limited to visual manifestations. In fact, there are several associated non-visual sensations mostly vestibular sensations, such as floating, elevation, lightness, tilting or vertigo (Hécaen & Ajuriaguerra, 1952; Grüsser & Landis, 1991; Blanke *et al.*, 2004); body schema disturbances; and visual body part illusions, such as the illusion of shortening, transformation or movement of an extremity (Menninger-Lerchenthal, 1935; Hécaen & Ajuriaguerra, 1952; Frederiks, 1969; Devinsky *et al.*, 1989; Brugger *et al.*, 1997). In addition to these sensory manifestations, AP are also associated with various emotions. Fear was reported most often, but also feelings of joy and elation. Some subjects considered the experience as neutral, yet intriguing and surprising (Devinsky *et al.*, 1989; Brugger *et al.*, 1994; Blanke *et al.*, 2004).

AP are associated with a wide range of neurological diseases: epilepsy, migraine, neoplasm, infarction, and infection (Grüsser & Landis, 1991; Denning & Berrios, 1994). Recent neurologic reports support the role of multisensory integration deficits of body-related information and vestibular dysfunctions in AP at the temporo-parietal junction (Blanke *et al.*, 2004; see also Blanke & Arzy, 2005), but other brain regions have been also implicated (Menninger-Lerchenthal, 1935; Hécaen & Ajuriaguerra, 1952; Devinsky *et al.*, 1989; Grüsser & Landis, 1991; Denning & Berrios, 1994; Brugger *et al.*, 1997)

Although AP were most often related to clinical situations, they have been found in 10% of the general population, occurring once or twice in a lifetime (Blackmore, 1982). AP are thus quite frequent experiences. Yet, their rarity in a lifetime, and their appearance mostly outside a clinical setting contribute to their lack of scientific examination within behavioral neurology and cognitive neuroscience. Nevertheless, AP (in the normal population) have been illustrated in many cultures (Blackmore, 1982). Yet, there are also some differences, which may be due to alternative approaches to the definition of body-boundaries that have been developed in different cultures. Eastern cultures generally have wider body borders and may include subjects and objects from extrapersonal space, while western cultures rather restrained the borders of the self and tied the self to the body borders (Kleinman, 1988). The ecstatic Kabbalists mediate between these two cultures in their emphasis on inducing AP, as well as in their influence on western mysticism and on its historical, cultural and intellectual consequences (Wirszubski, 1969; Scholem, 1969; Eco, 1989; Idel, 1989). In the following the ecstatic Kabbalists and their approach to AP will be presented. This will be followed by a detailed phenomenological analysis and discussion of the similarities and differences of their experiences with respect to AP in healthy and neurological subjects.

### III: The Ecstatic Kabbalah and its Technique

Abraham Abulafia was a thirteenth-century mystic who mainly lived in south-western Europe (see box 1). His mystical method focused on the nature of the human being and ways to reach states of prophetic-like ecstasy. The method was based on specific techniques, experiences and perceptions, unlike most

### Box 1: Abraham Abulafia

Born in Saragossa, Spain, in 1240, Abulafia's life was characterized by ceaseless wandering. His first journey was to Israel when he was 20 years old. On his return he determined to go to Rome, but stopped short in Capua, where he devoted himself with passionate zeal to the study of philosophy and the 'Guide for the perplexed' by Maimonides, under the tutelage of the well-known philosopher and physician Hillel ben-Samuel of Verona. With an eagerness to teach others, he wrote extensively on Kabbalistic, philosophical, and linguistic subjects, succeeding in surrounding himself with numerous students, to whom he imparted much of his enthusiasm. At the age of thirty-one he returned to Barcelona, where he immersed himself in the study of the book 'Yetzirah' [Creation] and its numerous commentaries. This book explains the creation of the world and man as based on letter combinations. The book, and particularly the commentary and method of the German mystic Eleazar of Worms, exercised a deep influence upon Abulafia, and greatly increased his mystical tendencies. Letters of the alphabet, numerals, vowel-points, all became symbols of existence to him. Their combinations and permutations possessed for him an illuminating power most effective in ameliorating his degree of perception and his ability to explore the riddles of mind, the problems of human life, and the purpose of the perceptions.

Abulafia soon left Spain again, and in 1279 wrote in Patras, Greece, the first of his prophetic books, *Sefer ha-Yashar* (The Book of the Righteous). Then, in 1280, he went to Rome to meet Pope Nicholas III. The Pope, then in Suriano, issued orders to burn the fanatic as soon as he reached town. The very night Abulafia arrived to Suriano, the Pope suddenly died. Returning to Rome, Abulafia was thrown into prison by the Minorites, but was released after four weeks detention. He was next heard of in Sicily, where he appeared as a prophet. The local Jewish congregation in Palermo addressed this issue to Shlomo ben-Aderet, who subsequently wrote a letter against Abulafia. Abulafia had to take up the pilgrim's staff anew, and under distressing conditions compiled his *Sefer ha-Ot* (The Book of the Sign) on the little island of Comino, near Malta, 1285–88. In 1291 he wrote his last work, *Imre Shefer* (Words of Beauty). Since then, all traces of him are lost (Adopted from Idel, 1988; 1989; Kohler *et al.*, 2002).

Kabbalah mystics — the Theurgic Kabbalists — who endeavoured to describe the structure of the divine and the processes running in them (Idel, 1988; Pines, 1988; Idel, 1990). Abulafia envisioned his prophetic-ecstatic Kabbalah as more advanced than previous forms, since it dealt mainly with linguistic matters. Thus, Abulafia invented a special technique using the basic stones of the 22 Hebraic letters and their combinations (Pines, 1988). The main 'prophetic-ecstatic' experience was characterized by the visual appearance of a human form. This form had the appearance of the mystic himself (the double or *Doppelgänger*), talked to the mystic,<sup>2</sup> and is similar to AP that we described above. In their writings, Abulafia and his followers detailed their methods and techniques, and described their visual and other sensory sensations during ecstasy in quite a detailed fashion.

[2] This linkage of linguistics and human form is derived from the second to sixth century 'Book of Creation' and from the idea that a demiurgic power is hidden in the speech and the letters (Scholem, 1971).

The ecstatic Kabbalists referred to the feeling of an 'autosopic' body as a higher mystical achievement. Such a connection, between mysticism and bodily sensation, was known from ancient times. Thus, one of the texts of Hellenistic magic, 'Mitrash Liturgy', contains a passage that speaks of man's 'perfected body' (Dietrich, 1923). In the Gnosis, there are also meetings between man and a primal celestial image, the *Doppelgänger*. According to *the song of the pearl* and *the song of the soul* this is one of the highest forms of self-knowledge (Reitzenstein, 1927; Meirovitch, 1972; Scholem, 1991), and comparable to eastern methods of Yoga or Tantric meditation,<sup>3</sup> Iranian Zoroastrianism and oriental-Greek Hesychasm<sup>4</sup> (Pangborn, 1983; Idel, 1988; Couliano, 1991). Yet, whereas in these other traditions the eventual goal is the achievement of maximal concentration by repeating a simple formula, Abulafia suggested a method that is based on a stimulus that continuously changed (Idel, 1988). His intention is not to relax the consciousness by meditation,<sup>5</sup> but to purify it via a high level of concentration which required doing many actions at the same time. For this, he used letters. He proposed to take two 'Names' that may contain up to 72 letters each, and pair them, resulting in as 5000 variations of combinations (Fig. 2a). To each letter, he added one of five possible vowels, created up to 25,000 combinations. This may be related to absorption, which Irwin (1985) has described as an important factor in OBEs. An individual in a state of absorption is in a 'heightened sense of the reality of the object of attention, even when the object is imaginal' (p. 280). To this basis Abulafia suggested adding physiological manoeuvres and mental imagery, similar to those utilized in modern experiments in cognitive science which use such techniques to induce similar conditions (Fig. 2b) (Palmer, 1978; Pylyshyn, 1979; Zacks *et al.*, 1999; Blanke *et al.*, 2005; see discussion).

Abulafia's method includes three steps (Idel, 1988). The first step, preparation: the mystic writes out different letter combinations (Fig.2a). The second step, physiological manoeuvres: the mystic chants the letters in conjunction with specific respiratory patterns, as well as head positioning. The third step, mental imagery of letters and human forms: the mystic imagines a human form, and himself without a body. Then the mystic 'draws' the letters mentally, projects them onto the 'screen' of the 'imaginative faculty', i.e. he mentally imagines the patterns of figure 2a. He then rotates the letters and turns them, as Abulafia describes in *Imrei Shefer*:

- 
- [3] There is an important similarity between Abulafia's technique and Tantric Sadhana practices. Both include mental rotation of letters and words, their recitation, and visualization of oneself as facing another similar image (see Gyatso, 1996). Mutual influence between eastern traditions such as Indian Tantra or Shamanism and western mystical techniques such as the one discussed here are also plausible (see for example Idel, 2005), and this influence requires further investigation.
- [4] In all of the rich magical papyri material there are very few Greek instructions on how to attain this 'self-vision', which we would expect, following Socrates' advice that in order to 'know thyself!' one should 'see thyself!' (Scholem, 1991). Using Abulafia's method, the mystic might follow this Socratic order when inducing AP during meditation.
- [5] As it is suggested by Bowers & Glasner (1958); in the same notion, it is hard to accept Abulafia's method as self-hypnosis. In hypnosis, the subject is required to lower his mental and physical activity, the opposite of Abulafia's requirements.

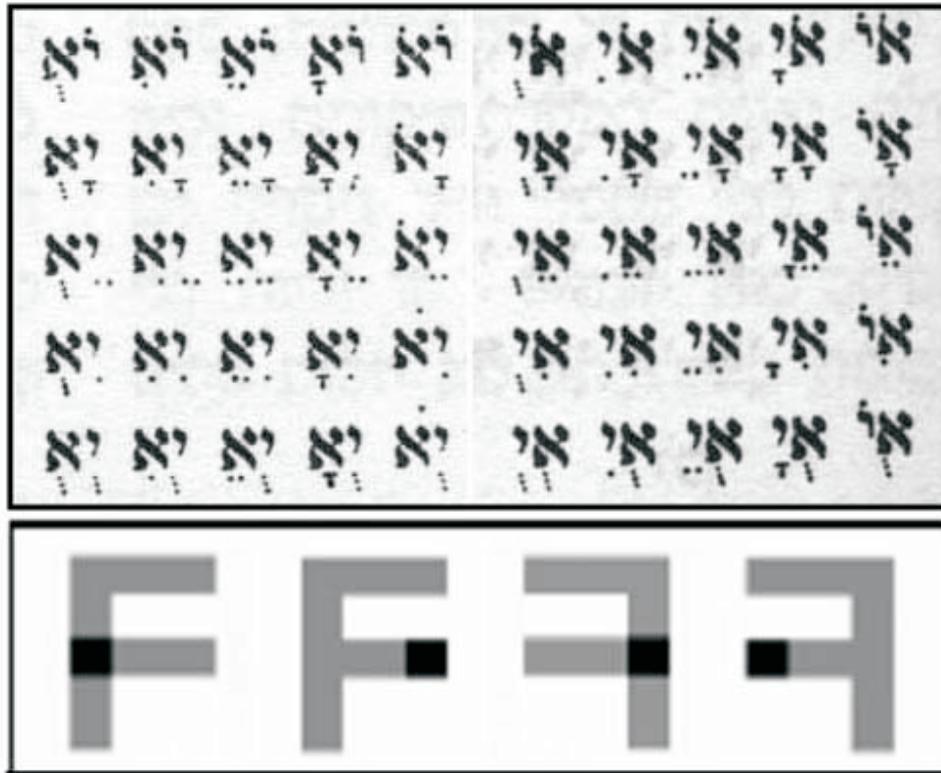


Figure 2. Letters tasks

*Figure 2a. Abulafia's letter combinations task:* Combinations of pairs of letters and vowels ( $\aleph = A$ ;  $\daleth = y$ ) before and after transformations. The signs underneath and above the letters are the vowels, which indicate different expression of each pair. See Idel (1988) for further details.

*Figure 2b. Temporary letter transformations task:* the four different stimuli as used in the letter transformations task of Blanke *et al.* (2005), designed to distinguish self mental-rotation from external mental-rotation.

And they [the letters], with their forms, are called the Clear Mirror, for all the forms having brightness and strong radiance are included in them. And one who gazes at them in their forms will discover their secrets and speak of them, and they will speak to him. And they are like an image in which a man sees all his forms standing in front of him, and then he will be able to see all the general and specific things (Ms. Paris BN 777, fol. 49).

During the final step of mental imagery, the mystic passes a succession of four experiences. The first is an experience of body-photism or illumination, in which light not only surrounds the body but also diffuses into it, giving impression that the body and its organs have become light.<sup>6</sup> As the ecstatic Kabbalist continues to practise, combining letters and performing physiological manoeuvres, the

[6] The connection between light and body was described in a school in Greece around the same time. In the history of Simon the theologian of the eleventh century the experience is described as coming into

result is the second experience: weakening of the body, in an 'absorptive' manner as described above.<sup>7</sup> Subsequently, the mystic may feel an enhancement of his thoughts and imaginative capacity (as described in *Sha'arei Tzedeq*). This is the third experience. The fourth experience is characterized mainly by fear and trembling.<sup>8</sup> Abulafia emphasizes that trembling is a basic and necessary step to obtain prophecy (*Sitrei Torah*, Paris Ms. 774, fol. 158a). In another place he writes: 'all your body will begin to tremble, and your limbs begin to shake, and you will fear a tremendous fear [...] and the body will tremble, like the rider who races the horse, who is glad and joyful, while the horse trembles beneath him' (*Otzar Eden Ganuz*, Oxford Ms. 1580, fols. 163b-164a; see also *Hayei Haolam Haba*, Oxford 1582, fol. 12a). For Abulafia the fear is followed by an experience of pleasure and delight. This feeling is a result of sensing another 'spirit' within his body, as he describes in *Otzar Eden Ganuz*: 'And you shall feel another spirit awakening within yourself and strengthening you and passing over your entire body and giving you pleasure' (Oxford Ms. 1580 fols. 163b-164a). Yet, a feeling of happiness is rare in descriptions given by Abulafia's followers. As one of his students writes (in *Sha'arei Tzedeq*): 'enormous trembling seized me, and I couldn't gather strength, and my hairs stood up' (Jerusalem Ms., 148 8° fols. 64b-65a). Only after passing these successive experiences does the mystic reach his goal: the vision of a human form, which is closely linked to his own physical appearance (see below) and generally experienced as standing in front of the mystic. The experience is increased when the mystic experiences his autoscopic form (or 'double') as speaking: the double begins to talk to the mystic, teaching him the unknown and revealing the future.

#### IV: Neurophenomenology

In this section we will describe autoscopic experience of seven ecstatic Kabbalists.<sup>9</sup> Using 'technical' mysticism, their writings are instructive, leading the performer through the sensations they experienced. Rarely, they express their experiences as first person descriptions.<sup>10</sup> However, the similarity between the instructional directives and the first person descriptions suggest that the instructions were probably based on first person experience.

---

the body (Hausherr, 1929); There were some attempts to explain these experiences, however without established rational fashion (Zimmer, 1960; Deikmann, 1962). For a general review of the light in mysticism see Eliade (1969).

- [7] Other mystics 'weakened' themselves or their bodies by other methods. For instance, the author of the book *Sha'arei Tzedeq* avoided sleeping for two nights, similar to descriptions of people who had AP after great efforts, like marathon running (Metzinger, 2005) or 12 hour-long work as a waitress (Green, 1968).
- [8] These feelings are described prior to OBEs (Green, 1968; Blackmore, 1982; Irwin, 1985; Blanke *et al.*, 2004).
- [9] The descriptions are based on the work of Idel (2001; 2002).
- [10] We assume that they followed Abulafia, whose interest was to present his strictly designed technique, rather than experiences. This is different from the experiences described in James' *Varieties* (1985).

*Mystic I (MI) – Abraham Abulafia (HAS)*

Abraham Abulafia describes the experience of seeing a human ‘form’ many times in his writings (for detailed quotes and references see Idel 1988; 1989; 2001). However, initially it is not clear who this ‘form’ is. As the dialogue between the mystic and the ‘form’ proceeds, the reader understands that the ‘form’ is the image of the mystic himself. Addressing his students and followers in *Sefer Hakheshek*, Abulafia further elaborates the scenario (New York Ms. JTS 1801, fol. 9a; British Library Ms. 749, fols. 12a-12b):

... and sit as though a man is standing before you and waiting for you to speak with him; and he is ready to answer you concerning whatever you may ask him, and you say ‘speak’ and he answers [...] and begin then to pronounce [the name] and recite first ‘the head of the head’ [i.e. the first combination of letters], drawing out the breath and at great ease; and afterwards go back as if the one standing opposite you is answering you; and you yourself answer, changing your voice ...

Apparently, by utilizing the letters of ‘the Name’ with specific breath techniques, a human form should appear. Only in the last sentence Abulafia suggests that this form is ‘yourself’. Yet he explicitly put it, as he has also explained in another book, *Sefer Hayei Haolam Haba*: ‘And consider his reply, answering as though you yourself had answered yourself’ (Oxford Ms. 1582, fol. 56b).

Most of Abulafia’s descriptions are written in a similar fashion. Yet, in *Sefer Haoth* Abulafia describes a similar episode, but from an explicit self-perspective. Upon a first reading it appears to be the form of another man:

I saw a man coming from the west with a great army, the number of the warriors of his camp being twenty-two thousand men [...] And when I saw his face in the sight, I was astonished, and my heart trembled within me, and I left my place and I longed for it to call upon the name of God to help me, but that thing evaded my spirit. And when the man has seen my great fear and my strong awe, he opened his mouth and he spoke, and he opened my mouth to speak, and I answered him according to his words, and in my words I became another man (pp. 81–2).

With respect to this passage, Idel (1988, pp. 95–100) suggests that ‘the man’ is Abulafia himself because he is ‘seen’ as having ‘a letter inscribed in blood and ink [...] like a shape of a staff separating between them, and it was a very hidden letter’. On the same page Abulafia continues that this ‘letter’ is the very sign of himself, and that ‘I looked [at him], and I saw there [in my heart] my likeness and image moving in two paths’.<sup>11</sup>

Regarding the different subtypes of AP, we suggest that Abulafia experienced HAS. We base this classification on the presence of several HAS components in his reports such as the presence of a strong affinity between Abulafia and the double, the sharing of the double’s self-location, and explicit reduplication of the self, in particular auditory reduplication. As exemplified in the first quote from *Sefer Hakheshek*, Abulafia describes the AP: ‘go back as if the one standing opposite you is answering you; and you yourself answer, changing your voice’.

[11] With respect to the army of 22,000 men, this might refer to the 22 Hebrew alphabet letters, the ‘tools’ Abulafia uses in his technique.

This is HAS, as Abulafia experienced his self to be localized at two positions at the same time, in his physical and the double's body. In addition to visualisation, Abulafia also describes speaking of the 'double' and an auditory dialogue between the physical and the autoscopic body (sharing of words and thoughts between subject and double). Interestingly, HAS was described as seeing of an identical image which is taken as another person, accompanied by a dialogue between self and double (Steffens & Grube, 2001). Absorption is the core of Abulafia's technique as he instructs the practitioner: 'and the one who draws them [the letters] should think as they are speaking with him like a man to his friend and as they are themselves men with speech ability' (Ms. New-York JTS 1801, fol. 8a). Finally, Abulafia describes the double in a standing position, and elaborates on the antecedent feelings of fear and trembling, which subsequently turn to delight.

*Mystic 2 (M2) – Nathan ben Sa`adyah Har'ar (HAS)*

An explicit description of AP is also found in the words of Abulafia's student, Nathan ben Sa`adyah Har'ar. In *Shushan Sodot* (Oxford Ms. 1655, fol. 69b) he is quoted: 'Know that the perfection of the secret of prophecy for the prophet is that he should suddenly see the "form" of himself standing before him'. He states further that 'one will then forget one's own self, which will then disappear from the subject. And the person will see the form of his self in front of him speaking with him and telling him the future'. Har'ar describes an experience of seeing a double, accompanied by depersonalization [disappearance of the subject] (Brugger *et al.*, 1997). As depersonalization is more commonly associated with HAS than with AH and because there is no mention of disembodiment or change in visuo-spatial perspective, we classify this scenario as HAS. In addition, Nathan heard the double speaking to him. With respect to position, the double was in a standing position, as the mystic's body. Further references can be found in Nathan's book *Sha'arei Tzedeq*. When he began practising Abulafia's method, Nathan has not yet succeeded in inducing AP despite his efforts:

And, with the combinations method and isolation it happened to me; what happened with the light I saw going on with me as I mentioned in *Sha'arei Tzedeq*. However, seeing a figure of myself standing before me, this I didn't arrive to do and couldn't on that (Oxford Ms. 1655, fol. 69b).

This description has special importance in that it testifies to the reliability of the present phenomenology. In addition, while inducing AP, Har'ar encountered different features of the phenomena, which are sometimes ignored due to the predominant emphasis on the form's appearance. As previously noted, by fasting and sleep deprivation, thought acceleration occurred, causing him the feeling that his forehead 'is going to be broken'. He also describes absorption: 'and all of these letters, one should move them in a fast movement which warms up the thought and increases eagerness and happiness' (Jerusalem Ms. 148 8°, fol. 73a).

He describes physical and emotional experiences: ‘enormous trembling seized me, and I couldn’t gather strength, and my hairs stood up’<sup>12</sup> (Jerusalem Ms., 148 8°, fols. 64b-65a), and the experience of body-photism:

in the third night [of practising the technique] after midnight, I nodded off a little, quill in hand and paper on my knees. Then I noticed that the candle was about to go out. I rose to put it right, as oftentimes happens to a person awake. Then I saw that the light continued, I was greatly astonished, as though, after close examination, I saw that it issues from myself. I said: I do not believe it. I walked to and fro all through the house and, behold, the light is with me; I lay on a couch and covered myself up, and behold, the light is with me all the while (Jerusalem Ms. 148 8°, fols. 63b-64a).

This scenic illumination occurred between waking and sleeping (hypnagogic), which has been described as classical situation in AP (Denning & Berrios, 1994). Further, the mystic was sitting and suddenly it happened. Finally, regarding auditory sensations (in the epoch of writing *Sha’arei Tzedeq*) Har’ar was not able to hear the double. Nevertheless, he heard a voice that emerged involuntarily from his own throat: ‘Behold, like the speech which emerges from my heart and comes to my lips, forcing them to move; and I said that perchance, God Forbid, it is a spirit of folly which has entered me, and I perceived it speaking [matters of] wisdom. I said that this is certainly the spirit of wisdom’ (Jerusalem Ms. 148 8°, fol. 65a).<sup>13</sup> As this is not speech of the ‘double’ as described by Abulafia, we do not classify it as such, nor as ‘hearing of a presence’ (HP) (see discussion) since in the latter the subject generally hears someone else speaking behind him, whereas Har’ar heard someone speaking within his body. A similar report is supplied by Brugger *et al.*’s subject 1 whose AP occurred while climbing in a high altitude: ‘I heard someone speaking French. The voice seemed to emanate from within my own body, and I heard myself responding. It was in French too — amazing, if you consider that I do not speak French at all...’ (Brugger *et al.*, 1999). Therefore, this may be a variant of the double’s speech in addition to the direct speech and the HP mentioned above (see discussion).

### *Mystic 3 (M3) – Yitzhak Hacoheh (HAS)*

Another important ecstatic mystic is Yitzhak Hacoheh. Though not a contemporary of Abulafia, Hacoheh was an earlier mystic who had a similar approach, and might have influenced the Abulafia school. He also witnesses AP as part of the ecstatic process (Idel, 1988, p. 73; Scholem, 1934; ibn-Gabai, *Avodat Hakodesh*):

All agree they possess the form of a body, similar to [that of] a human being, and very awesome. And the prophet sees all sorts of his powers becoming weaker and changing from form to form, until his powers cast of all forms and are embodied

[12] ‘My hairs stood up’ — in Hebrew, a common expression for intense fear (cf. the English phrase ‘My hair stood on end’).

[13] The tradition that the prophet expresses in his voice divine words originates in the midrash (see Heschel, 1962, pp. 267–8) and expressed by Azriel of Gerona and Haim Vital (Idel, 1988, pp. 67–8).

into the power of the form revealed to him, and then his strength is exchanged with the angel who speaks with him. And that form gives him strength to receive prophecy, and it engraved in his heart as a picture [...] the prophet casts of that form and returns to his original form, and his limbs and strength come back as they were before and are strengthened, and he prophesies in human form.

We classify this experience as HAS due to the presence of autoscopy, depersonalization, affinity between the physical body and the double, and the alternation between the last two as the subject is 'embodied' in the double, and then 'returns' into his 'original form'. Hacoheh's experience is also associated with the sensation of fear and weakness. The subject heard his double speaking to him although the experience is mostly visually. His body position is not mentioned. Although it could be argued that his experience contains some OBE-like features as 'are embodied into the power of the form revealed to him', Hacoheh do not explicitly describe disembodiment or an extracorporeal visuo-spatial perspective.

#### *Mystic 4 (M4) – Yitzhak of Acre (HAS)*

While practising Abulafia's technique, Yitzhak of Acre reports:

this supernal spirit of holiness suddenly comes [...] only heavenly voice speaking within it, teaching him [the mystic] sciences which have never been heard or have never been seen [...] [All this will happen] after he has stripped off every corporeal thing, because of the great immersion of his soul in the divine spiritual world. This 'container' will see his own form, literally standing before him and speaking to him, as a man who speaks to his friend; and his own [original] form will be forgotten as if his body doesn't exist in the world [...] their soul stands opposite them in the form of the very 'container' speaking with them, and they say that the Holy One, Blessed Be He, speaks with them. And what caused them this great secret? the stripping out of sensory things by their souls, and their divestment from them and the embodiment in the Divine Spirit (*Otsar Haim*, Moscow-Ginsburg Ms. 775, fols. 162b-163a).

He also adds a personal description 'that one day I was sitting and writing down a Kabbalistic secret, when suddenly I saw my body form standing in front of me and my self disappeared from me, and I refrained from writing but I was compelled' (*Shushan Sodot*, fol. 69b; Scholem, 1991, pp. 253–4; Idel, 2001). We classify Yitzhak of Acre's description as HAS for the following reasons: First, the experience of depersonalization reported by the mystic points to HAS. Secondly, the visuo-spatial perspective alternates between the physical body and the double. While it moves into the double, the physical body disappears. Finally, the standing position of the double is common in AH/HAS. Though emotions are not elaborated, he was 'compelled' by the experience.

#### *Mystic 5 (M5) – Elnathan ben-Moshe Kalkish (HAS)*

Elnathan ben-Moshe Kalkish analyses the AP evoked by Abulafia's technique and describes absorption. He claims that by completely concentrating on the process of letter combination, one may neglect all external stimuli. The internal

thought can ‘externalize’, causing the illusion that his own figure exists or speaks independently:

for every apprehension which man receives of the spiritual apprehensions, its beginning is in human thought, and when man thinks continually [...] and views all corporeal and bodily matters as the image of contingent things, and spiritual matters as the essential ones [...] and he shall do all this by combining the holy letters and words and the pure language, which are the vehicles of all thoughts, then there are born from their combination thoughts of wisdom and understanding, and, because of its intense meditation on them, the intellect will perceive reality, and there will come the renewed spirit [...] and will speak by itself, but the thinker will recognize that there is a mover and cause which causes him to think and to speak and to guide and to compose until, through the grate [mental] activity [by the technique] the inner one will return as if externally apprehended, and the two of them, the one apprehending and the object of apprehension, are one thing, and they are mental apprehension (*Even Sapir*, Paris Ms. 727, fols. 158a-158b).

Though not an explicit description, by analysing Kalkish’s experience inferences to some aspects of the phenomenology can be made. Thus, there is an ‘external’ form that speaks to the mystic, the ‘internal’. The two are one and seem to exist simultaneously. The self seems to extend and include both forms. The experience of the external form is described as an illusion with some degree of depersonalization, while both forms are ‘mentally apprehended’. Based on these observations (autoscopy, depersonalization, affinity, no disembodiment), we classify Kalkish’s experience as HAS. With regard to non-visual features, Kalkish does not mention the body position of the double, nor his associated emotions. However, the double is speaking to the mystic ‘by himself’; and this is a result of disciplined mental activity.

#### *Mystic 6 (M6) – Yehuda ben-Nissim ibn-Malka (AH)*

Another mystic from a close circle, Yehuda ben-Nissim ibn-Malka, also suggests that the ‘form’ reflects the physical appearance of the mystic himself. This is described in *Ktab Anas Uetafsir* (in: Vida, 1974, p. 22–3):

I have seen with my own eyes a man who saw a power in the form of an angel while he was awake, and he spoke with him and told him future things. The sage [angel] said: ‘Know that he sees nothing other than himself, for he sees himself front and back, as one who sees himself in a mirror, who sees nothing other than himself, and it appears as if it were something separate from your body, like you’. In the same manner, he sees that power, which guards his body and guides his soul and then his soul sings and rejoices, distinguishes and sees.<sup>14</sup>

[14] Immediately after the above citation, ibn-Malka offers an explanation that the process is a psychological one; namely, taking place between three inner faculties: ‘And three powers overcome him: the first power is that which is intermediary between spirit and soul, and the power of memory and the power of imagination, and one power is that which imagines. And these three powers are compared to a mirror, as by virtue of the mixing the spirit is purified, and by the purification of the spirit the third power is purified. But when the spirit apprehends the flux which pours out upon the soul, it will leave power to the power of speech, according to the flow which comes upon the soul, thus shall it influence the power of speech, and that itself is the angel which speaks to him and tells him future things’ (Vida, 1974, p. 23).

We classify ibn-Malka's experience as AH. The 'double' is described as 'separated' from the body with a weak affinity between the physical and autoscopic body. There is no hint of depersonalization or disembodiment. Interestingly, the mystic refers explicitly to mirror-like reflections to describe the autoscopic events. This analogy has also been mentioned by patients with autoscopic hallucination (i.e. Féré, 1891; Sollier, 1903; Brugger, 2002; hence the older term 'specular hallucinations'). Ibn-Malka describes a speaking double, without reference to emotion or position. Interestingly, the transformation 'front and back' described here is quite close to experimental procedures designed to investigate own body mental imagery (Zacks *et al.*, 1999) and autoscopic phenomena (Blanke *et al.*, 2005; see below for discussion).

#### *Mystic 7 (M7) – Sefer ha-Hayim (AH)*

The anonymous *Sefer ha-Hayim* (sometimes attributed to Abraham ibn-Ezra) states that:

in the manner that a man sees a form within the water or the form of the moon or the form of some other thing or the form of himself [...] he sees his own image in the light of God and His glory, and this is a form against my eyes' (Ms. Oxford-Bodleiana 574, fol. 13b).

This appears while the mystic prepares himself for the prophetic experience. Another paragraph of the anonymous Kabbalistic text (Ms. Oxford-Bodleiana 1954, fol. 68a) states that the manner of seeing one's own form is 'as one looks in a mirror'. Reflected in the following is the origin of the vision in the technique, and its emotional manifestations:

a vision occurred when a man is awake and reflects upon the wonder of God, or when he does not reflect upon them, but pronounces the Holy Names or those of angels in order that he be shown [whatever] he wishes or be informed of a hidden matter, and the Holy Spirit then reveals itself to him [...] and he trembles and shakes from the power of the holy spirit, and is unable to stand it (Ms. Oxford-Bodleiana 1574, fol. 34b).

Though not detailed, the descriptions point to AH, as suggested by the description of the 'form' as a mere image of the mystic, the term 'mirror' as well as the absence of descriptions of depersonalization and affinity between autoscopic and physical body. Furthermore, body position of the autoscopic double is not mentioned.

#### *Summary of results*

Amongst the mystics we reviewed, two had an experience of AH (M6; M7), five had HAS (M1-M5), none had OBE. All mystics described verbal communication between physical and autoscopic body. All mystics reported that they saw themselves in front-view, that is double and subject were facing each other; but two reported seeing themselves also in back view (M2; M6). Light as a prominent feature was described by two mystics (M2; M7). Five mystics mentioned the position of the autoscopic body, all of them saw their double in a standing

SUB NO.	NAME	AP	DISEMBODIMENT	DEPERSONALIZATION	SPEECH	DOUBLE'S POSITION	WEAKNESS	PREDOMINANT EMOTION
1	Abulafia	HAS (sim)	-	-	+	standing	n.r.	f,h
2	Nathan Har'ar	HAS (alt)	-	+	+	standing	+	f,s
3	Yitzhak Hacohen	HAS (alt)	+/-	+	+	n.r.	+	f
4	Yitzhak of Acre	HAS (alt)	-	+	+	standing	+	h,s
5	Kalkish	HAS (sim)	-	-	+	standing	n.r.	n.r.
6	ibn-Malka	AH	-	-	+	standing	n.r.	h
7	Sefer ha'Hayim	AH	-	-	+	n.r.	+	n.r.

*Table 1. Phenomenological findings in the writings of the Ecstatic Kabbalists*

(AP = Autoscopy Phenomena; HD = Hearing of the Double; HAS = HeAutoScopy;  
 AH = Autoscopyic Hallucination; sim = simultaneous type; alt = alternating type;  
 LC = Letter Combinations; n.r. = not reported; f = fear; h = happiness; s = surprise)

position (M1; M2; M4; M5; M6). Three mystics (M1; M2; M4) were sitting during the experience. Five mystics reported an experience of 'trembling' (M1; M2; M3; M4; M7). The sensation of fear was described only amongst HAS mystics (M1; M2; M3). Happiness was experienced by three of the mystics (M1; M4; M6). These phenomenological results are summarized in Table 1.

### **V: Discussion: Autosopic Phenomena in the Ecstatic Kabbalah**

In the following we will discuss the present results on AP in a group of ecstatic Kabbalists from the thirteenth century with respect to current studies on AP in neurological patients as well as in healthy subjects. We then evaluate the contribution of such a comparative approach in the study of mysticism for cognitive science and science of religious experience.

#### *Visuo-spatial perspective, self-location, and depersonalization*

Our data show that the above mystics had two types of AP: HAS and AH. Five of the seven mystics experienced HAS, which was characterized by the experience of a realistic double. In these latter cases self-location was frequently ambiguous as the mystic could not decide easily whether his self was localized in the physical or the autosopic body. Thus, mystics M1 and M5 experienced seeing the world from their embodied and the disembodied visuo-spatial perspective at the same time (simultaneous HAS): 'go back as if the one standing opposite you is answering you; and you yourself answer, changing your voice' (New York Ms., JTS 1801, fol. 9a). M2, M3 and M4 had the impression that they were alternating between the two positions and perspectives (alternating HAS) along with feeling of depersonalization while seeing the double ('my self disappeared from me'; Scholem, 1991, p. 254). Both types of HAS (simultaneous and alternating) have been described in neurological patients and healthy subjects. The simultaneous type was described by Blanke *et al.* (2004, case 2b) and the alternating type by Kamiya and Okamoto (1982), Brugger *et al.* (1994) as well as cases 4 and 5 in Blanke *et al.* (2004). Alternating and simultaneous HAS have also been described by Muldoon & Carrington (1929). Whereas all three HAS-mystics with alternating HAS experienced depersonalization, the HAS-mystics with simultaneous HAS did not. Clear disembodiment (experience of the self as being localized outside one's physical body boundaries) as described in OBEs was not described by any of the mystics.

Two of the mystics experienced AH, i.e., they saw their double in extrapersonal space viewed from their own physical body and perspective. The location of the observing self was, thus, unambiguous. These mystics felt that their center of awareness remained within their bodies and saw their double in extrapersonal space: 'something separate from your body like you' (Vida, 1974, p. 23). One AH-mystic stated that the double appeared 'in front' of him. Both AH-mystics explicitly used the term 'mirror image' to describe how they experienced seeing the autosopic body. This is typically reported by subjects with AH of neurological origin (Lukianowicz, 1958; Denning & Berrios, 1994). Finally, no

mystic with AH reported depersonalization or disembodiment, the first characterizes HAS (and OBE) and the second characterizes OBE. Due to the small sample size, we discuss our finding for HAS-mystics and AH-mystics together.

#### *Characteristics of the autoscopic body*

With regard to the visual characteristics of the double's body, five mystics reported seeing themselves in front-view, i.e. double and subject were facing each other (M1; M3; M4; M5; M7); two mystics (M2; M6) reported seeing back-view as well. All of the mystics saw the face of the autoscopic body (i.e. their 'double') as their own face. This was noted by Dening and Berrios (1994) in AP of psychiatric and neurological origin. Nevertheless, none of the mystics specifically mentioned seeing other parts of the autoscopic body or whether they saw their autoscopic body in its entirety. Partialness of the autoscopic body is commonly reported in AP subjects and Dening and Berrios (1994, p. 812) noted that 'in almost all cases the subject viewed the face, commonly the upper body, and less often the whole body'. Partialness was also common in psychiatric patients reported by Lukianowicz (1958) and neurological patients reported by Blanke *et al.* (2004).

Visual sensation of body photism was described by three mystics. Thus, M2 saw light as 'it issues from myself'. The experience of seeing a bright light coming from ones own body is also reported by Devinsky *et al.* (1989, case 4): 'light moved from my body on the floor. It lit up the room [...] somehow I became the light source'. The experience of illusory light sources or visual hallucinations had also been described by other patients (Lukianowicz, 1958 ['flashes']; Dewhurst and Pearson, 1955 ['white lights']; Blanke *et al.*, 2004, cases 1, 4, 6). The experience of light is also common in subjects with OBEs as was described by Twemlow *et al.*'s (1980) in 30% of subjects observing a brilliant white light during their OBE (quoted by Irwin, 1985, p. 95).

#### *Body position of the physical and autoscopic body*

Blanke *et al.* (2004) noted that AH- and HAS-patients tend to see their double in a standing/sitting position, identical to their physical body position, whereas patients with OBEs tend to have the experience in a supine position. The authors suggested that the patient's body position influences the experienced position of the autoscopic body. In the present study, in all instances where the mystic mentioned his position, mystic and double were in a sitting or standing position. Five mystics reported they saw their double in a standing position (M1; M2; M4; M5; M6). Three of them (M1; M2; M4) mentioned that they were themselves in a sitting position during the AP. M4 stated that he did not experience HAS until he got out of the supine position into the sitting position. The absence of OBEs in these ecstatic Kabbalists might, therefore, have been influenced by the sitting position that Abulafia instructed his followers to utilize: 'sit as though a man is standing before you' (*Sefer ha-Hesheq*, Ms. New York, JTS 1801, fol. 9a; Idel, 1988, pp. 111–12).

*Non-visual manifestations*

As previously reported, AP are not limited to the visual appearance of the autoscopic body (Lukianowicz, 1958; Blackmore, 1982; Irwin, 1985; Denning and Berrios, 1994), but include a selective set of other sensory manifestations (Devinsky *et al.*, 1989; Blanke *et al.*, 2004). Likewise, the present AP were associated with a variety of non-visual phenomena. Thus, five mystics reported sensations of 'trembling' (M1; M2; M3; M4; M7) which were previously reported in subjects with AP (Muldoon & Carrington, 1929; Menninger-Lerchenthal, 1935; Devinsky *et al.*, 1989; Grüsser & Landis, 1991). Although tactile and/or proprioceptive sensations were not described in the texts by the analysed mystic school, M2 associated the effect of the letter combinations method with vestibular manifestations: 'letters transpose [...] affects the "proper" balance of the body, so has this an effect on the soul by the power of the name' (Sha'arei Tzedeq, Jerusalem Ms., 148 8° fols. 48b-49a). Most mystics did not elaborate on locomotive action of the autoscopic body, yet Abulafia saw the double as approaching the physical body. No vestibular sensations were described.

A pattern that has not been widely reported previously was the frequent association of auditory manifestations. All mystics not only saw the double, but also heard the autoscopic body speaking. This may be similar to the observation made by Denning and Berrios (1994) who mentioned 'talking images' in patients with AP. Latter patients were characterized by male gender, a long duration of AP, and psychiatric illness. Likewise, cases D, F, and G of Lukianowicz (1958) stated that they 'heard' their double speak. Case D heard the double 'in my head and in my mind' and case G 'hear[d] him [the double] speaking to me'. A patient of Hécaen and Ajuriaguerra (1952) also heard his double speaking to him. Other forms of auditory phenomena, not directly related to the autoscopic body, have also been reported. Thus, cases 1 and 4 of Devinsky *et al.* (1989) heard a voice talking to them or to their double while having an OBE. A patient of Lunn (1970; case 1) reported formed auditory hallucinations ('voices from below') and case 3 of Devinsky *et al.* (1989) reported hearing a 'beeping sound'. Machinery sounds and undefined voices were also reported by Williams (1956). Blanke *et al.* (2003) suggested that there may be an auditory analogue to AP: the hearing of a presence. This is characterized by only hearing the double (or another person) close by, instead of seeing the double as in AP. This auditory form was described as the convincing feeling of hearing another person behind oneself. Blanke *et al.* (2003) suggested a functional relationship between hearing a presence with AP, i.e. non-visual auditory form of illusory self reduplication, although the person in the backspace was not identified as one's double but rather as another person. A third variant is reported by Nathan Har'ar (M2) and by Brugger *et al.*'s subject 1 who heard a voice emanating from their own body (Brugger *et al.*, 1999; see results).

With respect to the speaking double as described in the group of mystics and previous patients, the experience of a speaking double might result from an additional implication of brain functions related to audition and speech, whereas non-auditory AP do not interfere with these latter brain functions. Interestingly,

both auditory and language cortex are localized in close proximity to the anatomical site which was proposed to be involved in AP (Blanke *et al.*, 2004; Blanke & Arzy, 2005; see below). Alternatively, these phenomenological differences might be related to the fact that the mystics artificially induced their experiences, as Blackmore (1982) argued that AP which do not occur spontaneously, as most do, might differ in their phenomenology. The language-based induction method utilized by the mystics might also have led to a higher frequency of speaking doubles. As audition, like vision, balance, and somatosensation, is involved in the construction of the body image (Blanke *et al.*, 2003), we propose that the experience of a speaking double is due to additional interference with auditory mechanisms of own body perception (see Frith, 1996).

Emotions, evoked by the appearance of the double, were common. The sensation of fear was described by three mystics (M1; M2; M3). Happiness was experienced by three mystics (M1; M4; M6). Emotional association with dominance of fear is described in the neurological literature (Lukianowicz, 1958; Blackmore, 1982; Irwin, 1985; Blanke *et al.*, 2004). Concerning a surprise by the appearance of the double, three mystics (M2; M3; M4) described such a feeling, as is also described in neurological literature (Lukianowicz, 1958; Blackmore, 1982; Irwin, 1985).

#### *Abulafia's technique with respect to other induction techniques*

Most mystical and scientific techniques that have been applied to induce AP tried to induce OBEs (Blackmore, 1982). Yet, mystics that have used Abulafia's method experienced HAS/AH which might be due to several characteristics of Abulafia's technique. Many aspects of the method such as respiration, concentration and sleep deprivation (Blackmore, 1982) and even the use of letters and words, rotating and reciting them (Gyatso, 1996), were not unique to Abulafia. However, he makes an important use of a vast number of combinations as well as own body mental imagery task as 'in a mirror'. With regard to letter combinations, Abulafia's method combines two aspects, a verbal one and an imagery one. With respect to the verbal aspect, the mystic performs reverberations involving reading and speaking, mainly a left hemispheric process. With regard to mental imagery, Nathan ben Sa`adya Har'ar describes:

If he is able to compel and to further draw [from his thought] it will emerge from within to without, and it will be imagined for him by the power of his purified imagination in the form of a pure mirror, [...] back side is transformed and becomes the front, and he recognizes the nature of its inner side from the outside (*Sha'arei Tzedeq*, p. 27, translated by Scholem, 1995, p. 155 in a different manner).

Later phases move from the mental image of letters to the human form. As ibn-Malka describes the mystic 'sees himself from the front and the back, as one who sees himself in a mirror'. This is similar to methods applied by contemporary authors (Ratcliff, 1979; Zacks *et al.*, 1999; Blanke *et al.*, 2005) using own-body mental imagery tasks. Another factor, contributing to the appearance of AH/HAS in Abulafia's method rather than OBEs, may be due to the mystic's

position during the experience. Blanke *et al.* (2004) observed that HAS/AH were associated with a standing or sitting position, whereas OBE occurred in a supine position. As the mystics were generally sitting or standing their position might have led to the induction of HAS and AH.

#### *Anatomical and functional considerations*

The brain region that has been shown to be associated with AP is the temporo-parietal junction (TPJ) as interference with this area has been found to be associated with AP in lesion and electrophysiological studies (Fig. 3; for further details see Blanke *et al.*, 2002; 2004). In addition, neuroimaging studies implicate the TPJ as the area associated with sensations of AP, like body image and self perception (for review see Decety and Sommerville, 2003; Blanke & Arzy, 2005). The associated auditory sensations, described by all mystics may also be linked to the TPJ because the primary and secondary auditory cortex is just anterior to the TPJ (Firth & Bolay, 2004; see there for discussion on AP and HP in high altitude and the TPJ). In addition, electrophysiological, neuropsychological and neuroimaging studies suggest that the TPJ and adjacent cortical areas such as the inferior parietal lobule combine auditory information and other sensory information, such as vision and touch, in a coordinated reference frame for personal and peripersonal space (Guldin & Grüsser, 1998; Duhamel *et al.*, 1998; Bremmer *et al.*, 2001; La'davas, 2002).

Further characteristics of Abulafia's method may be linked to the TPJ. It relies on mental imagery, a function that involves the TPJ (Zacks *et al.*, 1999; Zacks *et al.*, 2002; Blanke *et al.*, 2004; Blanke *et al.*, 2005). Moreover, given the central

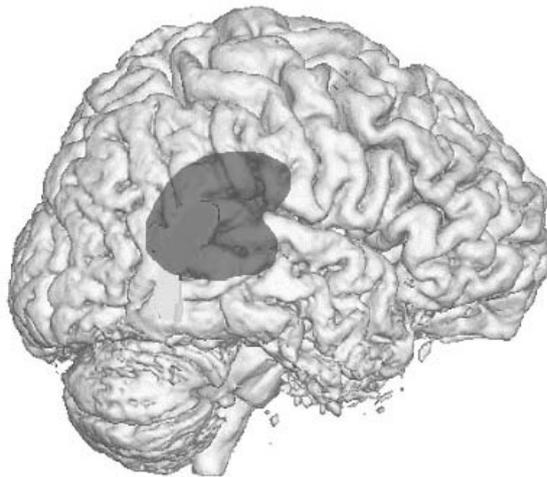


Figure 3. The temporo-parietal junction (TPJ)

This brain region is supposed to be responsible to the integration of multisensory inputs and to self-processing; thus creating fundamental mental contents as agency (being author of one's own thoughts and actions), self-other distinction and self-location. Disturbance of the activity in this region may lead to AP (for further details see Blanke & Arzy, 2005).

role of language and letters in Abulafia's method and the prime importance of the left TPJ in language function (i.e. Wernicke's area; Hustler & Galuske, 2003; Cohen & Dehaene, 2004), Abulafia's method may modulate activity at the left TPJ or adjacent regions by reading and rehearsal of letters. Accordingly, neuroimaging studies suggest that mental imagery with respect to letters (like in a line orientation task, letter matching task or letter-case judgement task) or phonemes reading and/or expressing (like in rhyming tasks) as in Abulafia's method lead to an activation of the left TPJ and near areas (Pugh *et al.*, 1996; Shaywitz *et al.*, 1998; Temple *et al.*, 2001; Xu *et al.*, 2001). Finally, damage to the left TPJ may lead to aphasia or alexia (Iragui & Krichevsky, 1991; Shaywitz *et al.*, 1998; Temple *et al.*, 2001; Cohen *et al.*, 2003). Moreover, with respect to mental own body imagery, several recent studies suggest methods to induce OBEs that are quite similar to Abulafia's method. Thus, Palmer (1978) used similar steps as Abulafia relying on successive steps of relaxation, a visual trigger (a turning spiral) and mental imagery of an OBE-like situation (the subjects were instructed to imagine a figure they had seen before). In neuroimaging studies of a mental own body imagery task (that were mentioned above), authors asked healthy subjects to imagine themselves in the position that is characteristically reported by OBE and HAS patients and found this to activate the TPJ (Zacks *et al.*, 1999; Blanke *et al.*, 2005).

#### *The importance of neuro-phenomenology in the study of mysticism*

Important as they indeed are in normal life and in its religious moments, mystical experiences are almost never accessible to the scholars interested in examining them. One problem is that the descriptions reflect unique terminologies, theologies and realia, which are different from those known to the scholar (Idel, 1990). Therefore, some modern scholars of religious experience focused their inquiry on subjective experience, rather than theological data (Moore, 1978; Idel, 1990). Yet, highly subjective experience is not easily approachable either. The comparison we suggest here between mediaeval mystics and contemporary findings in healthy and neurological subjects arms the scholar with a new access to these experiences. The tools of cognitive neuroscience make it possible to approach mystical experiences not only by semantical analysis of the mystics' writings, but also by approaching similar mystical experiences in healthy and neurological patients in conjunction with analysis by neuropsychological methods, experimental paradigms, lesion studies, and brain imaging studies. AP exemplify such a comprehensive approach: on the one hand, AP are important parts of the mystical experience and essential to many forms of ecstasy like soul-traveling, unio-mystica, and OBE (Couliano, 1983; 1991; Idel, 1990; Hollenback, 1996). On the other hand, AP are also present in the normal population and in neurological patients with no mystical interest at all (Blackmore, 1982; Blanke *et al.*, 2004).

The above discussion points to a more general phenomenon in visions of revelation that might be described as the shifting of the centre of gravitation from the

outer, common and public revelation, to the more individual and intimate aspects of the experience. Thus, in contrast to the assumption that religion is a special type of human experience to be analysed by tools specific to this field, cognitive approaches assume that religion is one of many other human creations, and as such it should be incorporated into the study of human creativity, i.e. understanding how the human mind operates the systemic nature of creativity. On the other hand, cognition may be considered as integral part of the religious system, as religions include important cognitive aspects (beliefs, cosmologies, symbolisms). This is especially true for those religions that place greater emphasis on rituals, magical practices and mystical techniques. Therefore, religious experience may be induced by resorting to the bodily exercises prescribed to attain changes in one's internal mental states (Idel, 2005).

We presented here a group of mystics who achieved their mystical experience of revelation and prophecy by using a practical technique which changed their internal mental state. This consonance may be of importance not only in the cases discussed above, but also in an improved understanding of religious experience in general. Thus, a central role in the understanding of the mystical experience may belong to the techniques and practices performed by the mystic, and to their realization through physiological and psychological mechanisms. Interestingly, some of the 'mystical' techniques are used today in laboratory settings to investigate central processes of mental imagery. Therefore, in the study of mysticism, interdisciplinary approaches might be as valuable to scholars (Idel, 2004) as to contemporary philosophers who use these experiences for understanding the concept of mind (Metzinger, 2003; 2005). Cognitive Neurosciences, in turn, might profit from the research of mysticism in their endeavour to further our understanding of mechanisms of own body perception and self consciousness (Forman, 1998).

### Conclusion

Abundant in folklore, mythology, and the spiritual experiences of ancient and modern societies, AP have fascinated mankind from time immemorial (see Blackmore, 1982; Irwin, 1985). Thomas Metzinger claimed that 'our traditional, folk-phenomenological concept of a 'soul' may have its origins in accurate and truthful first-person reports about the experiential content of a specific neurophenomenological state-class', i.e. AP (Metzinger, 2005, p.1). He claims that our contemporary folk-psychology about mind might have emerged from the older notion of 'soul', which in turn may be related to autoscopic mystical, mythical and historical descriptions. The soul, or 'proto-concept of mind', as Metzinger names it, may be a direct derivative of the experience of AP, which led men 'to first start developing a theory of mind' (p. 2). The ecstatic Kabbalah mystics perceived the AP as if the self would be separated not only from the human body but also from the 'original' self, and is reified in an entity standing before them. The ecstatic Kabbalists interpreted it by a model of different levels of self (Idel, 2001). Regarding the mutual influence between the ecstatic Kabbalah, Moslem Sufi and astro-magical traditions as well as Christian

mysticism,<sup>15</sup> the above observations might have relevance for the understanding of the proto-concept of mind and the roots of western culture (Scholem, 1969; Wirszubski, 1969; Idel, 2001; Shoham, 2003). Finally, for cognitive science, AP present a valuable advantage to consciousness studies as well as neuropsychological understanding of the ‘self’, since during AP fundamental components of the self are isolated. In this manner, the technical and phenomenological work of Abulafia’s school may be considered as an important exploration of the human ‘self’.

### *Acknowledgment*

The authors thank Dr. Sara Mordzinski for helpful comments on the manuscript.

### **Appendix A: Kataphatic Mysticism and Apophatic Mysticism**

Forman (1998) discusses mysticism as a subject for consciousness studies and as an opportunity to search for neurocognitive phenomena in healthy subjects. He proposes to divide the mystical experience to two main faculties: The first is a faculty that conquers full attention of the subject, by filling the subject’s awareness with different perceptions or hallucinations (*kataphatic mysticism*). The second is an emptying of the awareness of all stimuli (*apophatic mysticism*). Forman suggests that in particular the second type might provide useful insights into the mechanisms of consciousness and calls it pure consciousness events.

Forman does not discuss potential contributions through investigation of the kataphatic mysticism, which he claims to consist mainly of hallucinations of all types and related to schizophrenia — not the healthy position that drove him to explore mystical experience. We believe that ecstatic mystical experience, like the experience described here, provides useful insights into the mechanisms of consciousness, though it belongs to the full attention route. We emphasized the scientific-like basis of such a technique, which is very close to current laboratory experimental tasks (Zacks *et al.*, 1999; Blanke *et al.*, 2005). Thus, a technical approach leads the practitioner to a unique consciousness state. A detailed and precise phenomenology of ecstatic mystic experience may serve neurocognitive science and consciousness studies with rich sources of data about the mind, brain and the inner world.

### **References**

- Bear, D.M. & Fedio, P. (1977), Quantitative analysis of interictal behaviour in temporal lobe epilepsy, *Archives of Neurology*, **34**, pp. 454-67.
- Blackmore, S.J. (1982), *Beyond the Body. An Investigation of Out-of-Body Experiences* (London: Heinemann).
- Blanke, O., Ortigue, S., Landis, T., & Seeck, M. (2002), ‘Stimulating illusory own-body perceptions’, *Nature*, **419**, pp. 269–70.
- Blanke, O., Ortigue, S., Coeytaux, A., Martory, M.-D. & Landis, T. (2003), ‘Hearing of a Presence’, *Neurocase*, **9**, pp. 329–39.

[15] This was firstly claimed by the German scholar Johannes Reuchlin (1455–1522). The writings of Abulafia were translated into Latin and Italian, thus became available to Christian scholars and mystics.

- Blanke, O., Landis, T., Spinelli, L. & Seeck, M. (2004), 'Out-of-body experience and autoscopia of neurological origin', *Brain*, **127**, pp. 243–58.
- Blanke, O. (2004a), Illusions visuelles in *Neuro-Ophthalmologie*: ed. A. B. Safran (Paris: Masson), pp. 147–50.
- Blanke, O. & Arzy, S. (2005), 'Out-of-body experiences due to disturbed self processing at the right temporo-parietal junction', *The Neuroscientist*, **11**, pp. 16–24.
- Blanke, O., Mohr, C., Michel, C.M., Pascual-Leone, A., Brugger, P., Seeck, M., Landis, T., Thut, G. (2005), 'Linking out-of-body experience and self processing to mental own-body imagery at the temporoparietal junction', *Journal of Neuroscience*, **25**, pp. 550–7.
- Bowers, M. & Glasner, S. (1958), 'Autohypnotic aspects of the Kabbalistic concept of Kavana', *Journal of Clinical and Experimental Hypnosis*, **6**, pp. 3–23
- Bremmer, F., Schlack, A., Duhamel, J.R., Graf, W. & Fink, G.R. (2001), 'Space coding in primate posterior parietal cortex', *Neuroimage*, **14**, S46–51.
- Brugger, P., Agosti R., Regard M., Wieser H.G. & Landis T. (1994), 'Heautoscopy, epilepsy, and suicide', *Journal of Neurology, Neurosurgery & Psychiatry*, **57**, pp. 838–9.
- Brugger, P., Regard M. & Landis T. (1997), 'Illusory reduplication of one's own body: phenomenology and classification of autoscopic phenomena', *Cognitive Neuropsychiatry*, **2**, pp. 19–38.
- Brugger, P., Regard, M., Landis, T. & Oelz, O. (1999), 'Hallucinatory experience in extreme-altitude climbers', *Neuropsychiatry, Neuropsychology and Behavioral Neurology*, **12**, pp. 67–71.
- Brugger, P., (2002), 'Reactive mirrors. perspective taking in autoscopic phenomena', *Cognitive Neuropsychiatry*, **7**, pp. 179–94.
- Cohen, L., Martinaud, O., Lemer, C., Lehericy, S., Samson, Y., Obadia, M., et al., (2003), 'Visual word recognition in the left and right hemispheres: anatomical and functional correlates of peripheral alexias', *Cerebral Cortex*, **13**, 1313–33.
- Cohen, L. & Dehaene, S. (2004), 'Specialization within the ventral stream: the case for the visual word form area', *Neuroimage*, **22**, pp. 466–76.
- Coulouano, I.P. (1983), *Psychanodia I: A Survey of the Evidence Concerning the Ascension of the Soul and its Relevance* (Leiden, Brill).
- Coulouano, I.P. (1991), *Out of this World. Otherworldly Journeys from Gilgamesh to Albert Einstein*, (Shambhala, Boston and London).
- Decety, J. & Sommerville, J.A. (2003), 'Shared representations between self and other: a social cognitive neuroscience view', *Trends in Cognitive Sciences*, **7**, pp. 527–33.
- Deikman, A.J. (1962), 'Deautomatization and the mystic experience', in *Altered States of Consciousness*, ed. C. T. Tart (New York), p. 40.
- Dening, T.R. & Berrios, G.E. (1994), 'Autoscopic phenomena', *British Journal of Psychiatry*, **165**, pp. 808–17.
- Devinsky, O., Feldmann, E., Burrowes, K. & Bromfeld, E. (1989), 'Autoscopic phenomena with seizures', *Archives of Neurology*, **46**, pp. 1080–8.
- Dewhurst, K. & Pearson, J. (1955), 'Visual hallucinations of the self in organic disease', *Journal of Neurology, Neurosurgery & Psychiatry*, **18**, pp. 53–7.
- Dietrich, A. (1923), *Eine Mithrasliturgie* (Leipzig : B.G. Teubner).
- Duhamel, J.R., Colby, C.L. & Goldberg, M.E. (1998), 'Ventral intraparietal area of the macaque. Congruent visual and somatic response properties', *Journal of Neurophysiology*, **79**, pp. 126–36.
- Eco, U. (1989), *Foucault's Pendulum* (New York: Harcourt).
- Eliade, M. (1969), *The Two and the One*, (London: Harvell Press), pp. 19–77.
- Féré, C. (1891), 'Note sur les hallucinations autoscopiques ou spéculaires et sur les hallucinations altruistes', *C.R. Séance Sociale Biologie*, **3**, pp. 451–3.
- Firth, P.G. & Bolay, H. (2004), 'Transient high altitude neurological dysfunction: an origin in the temporoparietal cortex', *High Altitude Medicine & Biology*, **5**, pp. 71–75.
- Forman, R.K.C. (1998), 'What does mysticism have to teach us about consciousness?' *Journal of Consciousness Studies*, **5**, pp. 185–201.
- Foxe, J.J., Wylie, G., Martinez, A., Schroeder, C.E., Javitt, D.C., Guilfoyle, D., Ritter, W. & Murray M.M. (2002), 'Auditory-somatosensory multisensory processing in auditory association cortex: An fMRI study', *Journal of Neurophysiology*, **88**, pp. 540–4.
- Frederiks, J.A.M. (1969), 'Disorders of the body schema', in *Handbook of neurology*, Vol. 4. eds. P.J. Vinken & G.W. Bruyn GW (Amsterdam: North-Holland) pp. 207–40.

- Frith, C. (1996), 'The role of the prefrontal cortex in self-consciousness: the case of auditory hallucinations', *Philosophical Transactions of the Royal Society of London B*, **351**, pp. 1505–12.
- Geschwind, N & Sherwin, I. (1967), 'Language-induced epilepsy', *Archives in Neurology*, **16**, pp. 25–31.
- Green, C.E. (1968), *Out-of-Body Experiences* (Oxford: Institute of Psychophysical Research).
- Grüsser, O.-J. & Landis, T. (1991), 'The splitting of 'I' and 'me'. Heautoscopy and related phenomena', in *Visual Agnosias and Other Disturbances of Visual Perception and Cognition*, eds. O.-J. Grüsser & T. Landis (Amsterdam: MacMillan), pp. 297–303.
- Guldin, W.O. & Grüsser O.-J. (1998), 'Is there a vestibular cortex?', *Trends in Neuroscience*, **21**, pp. 254–9.
- Gyatso, G.K. (1996), *Guide to Dakini Land: The Highest Yoga Tantra Practice of Buddha Vajrayogini* (London: Tharpa Publications).
- Halligan, P.W., Fink, G.R., Marshall, J.C. & Vallar G. (2003), 'Spatial cognition. evidence from visual neglect', *Trends in Cognitive Sciences*, **7**, pp. 125–33.
- Heschel, A. (1962), *The Prophets* (New York), pp. 390–409.
- Hausherr, I. (1929), 'La Methode d'Oraison Hesyhaste', *Orientalia Christiana IX*, pp. 128-9.
- Hécaen, H. & Ajuriaguerra, J. (1952), 'L'heautoscopie', in *Meconnaissances et Hallucinations Corporelles* eds. H. Hécaen & J. Ajuriaguerra (Paris: Masson), pp. 310–43.
- Hollenback, J.B. (1996), *Mysticism, Experience, Response and Empowerment*, (Pennsylvania: Pennsylvania State University Press)
- Hustler, J. & Galuske, R.A.W. (2003), 'Hemispheric asymmetries in cerebral cortical networks', *Trends in Neuroscience*, **26**, pp. 429–35.
- Idel, M (1988), *The Mystical Experience in Abraham Abulafia* (Jerusalem: Magnes/ Albany: State University of New York Press).
- Idel, M. (1989), *Language, Torah, and Hermeneutics in Abraham Abulafia* (Albany: State University of New York Press).
- Idel, M. (1989a), 'Universalization and Integration: Two Conceptions of Mystical Union in Jewish Mysticism', in *Mystical Union and Monotheistic Faith, An Ecumenical Dialogue*, eds. M. Idel & B. McGinn, (New York: MacMillan), pp. 49–50.
- Idel, M. (1990), *Kabbalah: New Perspectives*, (New Haven: Yale University Press).
- Idel, M. (2001), *Natan ben Sa'adyah Har'ar, le Porte della Giustizia (Sha'arei Tzedeq)*, tr. Maurizio Mottolose. (Milano: Adelphi).
- Idel, M. (2004), 'On the Theologization of Kabbalah in Modern Scholarship', in *Religious Apologetics – Philosophical Argumentation*, eds. Y. Schwartz and V. Krech, (Tuebingen: Moher), pp. 123–74.
- Idel, M. (2005), *Ascensions on high in Jewish Mysticism*, (Budapest: Central European University Press).
- Iragui, V.J., Kritchevsky, M. (1991), 'Alexia without agraphia or hemianopia in parietal infarction', *Journal of Neurology, Neurosurgery & Psychiatry*, **54**, pp. 841–2.
- Irwin, H.J. (1985), *Flight of Mind. A Psychological Study of the Out-of-Body Experience*, (Metuchen, NJ: Scarecrow Press).
- James, W. (1985), *The Varieties of Religious Experience. A Study in Human Nature* (New York: Penguin).
- Kamiya, S. & Okamoto S. (1982), 'Double consciousness in epileptics: A clinical picture and minor hemisphere specialization', in *Advances in Epileptology: XIIIth Epilepsy International Symposium*, eds. H. Akimoto, H. Kazamatsuri, M. Seino & A. Ward, (New York: Raven Press).
- Kleinman A. (1988), *Rethinking Psychiatry: From Cultural Category to Personal Experience*, (New York: The Free Press).
- Kohler, K., Bloch, P., Kayserlyng, M. & Wendland, P. (2002), 'Abulafia, Abraham', *JewishEncyclopedia.com*.
- La'davas, E. (2002), 'Functional and dynamic properties of visual peripersonal space', *Trends in Cognitive Sciences*, **6**, pp. 17–22.
- Lukianowicz, N. (1958), 'Autoscopic phenomena', *Archives of Neurology & Psychiatry*, **80**, pp. 199–220.
- Lunn, V. (1970), 'Autoscopic phenomena', *Acta Psychiatria Scandinavia*, **46** (219), pp. 118-25.
- Meirovitch, E. (1972), *Mystique et Poesie en Islam* (Paris: Desclee de Brouwer), pp. 284–6.

- Melzack, R. (1990), 'Phantom limbs and the concept of a neuromatrix', *Trends in Neuroscience*, **13**, pp. 88–92.
- Menninger-Lerchenthal, E. (1935), *Das Truggebilde der Eigenen Gestalt*, (Berlin: Karger).
- Metzinger, T. (2003), *Being No One. The Self-Model Theory of Subjectivity*, (Cambridge: Bradford Books).
- Metzinger, T. (2005), 'The pre-scientific concept of a 'soul'. A neurophenomenological hypothesis about its origin', in *Auf der Suche nach dem Konzept/Substrat der Seele. Ein Versuch aus der Perspektive der Cognitive (Neuro-) Science*, ed. M. Peschl, (Würzburg: Königshausen und Neumann).
- Moore, P. (1978), 'Mystical Experience, Mystical Doctrine, Mystical Technique', in *Mysticism and Philosophical Analysis*, ed. S.T. Katz, (New York: Oxford University Press), pp. 112–14.
- Muldoon, S.J. & Carrington, H. (1929), *The Projection of the Astral Body*, (London: Rider).
- Palmer, J., (1978), 'ESP and out-of-body experiences. an experimental approach', in *Mind Beyond the Body*, ed. D.S. Rogo, (Harmondsworth: Penguin), pp. 193–217.
- Pangborn, C.R. (1983), *Zoroastrianism: a Beleaguered Faith* (New York : Advent Books).
- Pines, S. (1988), Introduction to M. Idel, *The Mystical Experience in Abraham Abulafia* (Jerusalem: Magnes./Albany: State University of New York Press).
- Pugh, K.R., Shaywitz, B.A., Shaywitz, S.E., Constable, R.T., Skudlarski, P., Fulbright, R.K., Bronen, R.A., Shankweiler, D.P., Katz, L., Fletcher, J.M. & Gore, J.C. (1996), 'Cerebral organization of component processes in reading', *Brain*, **119**, pp. 1221–38.
- Pylyshyn, Z.W. (1979), 'The rate of 'mental rotation' of images. a test of a holistic analogue hypothesis', *Memory and Cognition*, **7**, pp. 19–28.
- Ramachandran V.S. & Hirstein W. (1998), 'The perception of phantom limbs', *Brain*, **121**, pp. 1603–30.
- Rank, O. (1925), *Der Doppelgänger. Eine Psychoanalytische Studie* (Leipzig: Internationaler Psychoanalytischer Verlag).
- Ratcliff, G. (1979), 'Spatial thought, mental rotation and the right cerebral hemisphere', *Neuropsychologia*, **17**, pp. 49–54.
- Reitzenstein, R. (1927), *Die Hellenistischen Mysterienreligionen*, 3<sup>rd</sup> ed. (Leipzig: J.C. Hinrichs).
- Scholem, G. (1934), 'R. Moshe of Burgos, a student of R. Yitzhak', *Tarbiz*, **5**.
- Scholem, G. (1969), *The Kabbalah of Sefer Hatmuna and Abraham Abulafia*, ed. J. Ben-Shlomo, (Jerusalem: The Hebrew University).
- Scholem, G. (1971), 'Golem', *Encyclopedia Judaica*.
- Scholem, G (1991), *On the Mystical Shape of the Godhead*, (New York: Schocken Books).
- Scholem, G. (1995), *Major Trends in Jewish Mysticism*, (New York: Schocken Books).
- Shaywitz, S.E., Shaywitz, B.A., Pugh, K.R., Fulbright, R.K., Constable, R.T., Mencl, W.E., Shankweiler, D.P., Liberman, A.M., Skudlarski, P., Fletcher, J.M., Katz, L., Marchione, K.E., Lacadie, C., Gatenby, C. & Gore, J.C. (1998) 'Functional disruption in the organization of the brain for reading in dyslexia', *Proceedings of the National Academy of Science U.S.A.*, **95**, pp. 2636–41.
- Sheils, D. (1978), 'A cross-cultural study of beliefs in out-of-the-body experiences, waking and sleeping', *Journal of Sociological & Psychological Research*, **49**, pp. 697–741.
- Shoham, G. (2003), *The Mytho-Empiricism of Gnosticism. Triumph of the Vanquished* (Brighton: Sussex Academic Press).
- Sollier, P.A., (1903) *Les Phénomènes D'autoscopie* (Paris: Félix Alcan).
- Sparks, D.L. (1986), 'Translation of sensory signals into commands for control of saccadic eye movements. Role of primate superior colliculus', *Physiological Reviews*, **66**, pp. 118–71.
- Steffens, M. & Grube, M. (2001), 'Phenomenology of heautoscopy. Case report of atypical mirror hallucination', *Psychiatrische Praxis*, **28**, pp. 189–92.
- Stein, M.E. & Meredith, M.A. (1993), *The Merging of the Senses*, (Cambridge: MIT Press, 1993).
- Temple, E., Poldrack, R.A., Salidis, J., Deutsch, G.K., Tallal, P., Gabrieli, M.M. & Gabrieli, J.D. (2001), 'Disrupted neural responses to phonological and orthographic processing in dyslexic children. An fMRI study', *NeuroReport*, **12**, pp. 299–307.
- Vida, Y.A. (1974), *R. Yehuda ben-Nissim ibn-Malka, Ktab Anas Uetafsir* (Ramat Gan).
- Williams, D. (1956), 'The structure of emotions reflected in epileptic experience', *Brain*, **79**, pp. 29–67.

- Wirszubski, H. (1969), 'Liber Redemptionis — an early version of Kabbalistic commentary to the guide for perplexed of Abraham Abulafia in the Latin translation of Plavius Mythridates', *Annals of Israeli National Academy of Science*, **3**, pp. 135–49.
- Xu, B., Grafman, J., Gaillard, W.D., Ishii, K., Vega-Bermudez, F., Pietrini, P., *et al.*, (2001), 'Conjoint and extended neural networks for the computation of speech codes. The neural basis of selective impairment in reading words and pseudowords', *Cerebral Cortex*, **11**, pp. 267–77.
- Zacks, J. M., Rypma, B., Gabrieli, J., Tversky, B. & Glover, G. (1999), 'Imagined transformations of bodies. An fMRI study', *Neuropsychologia*, **37**, 1029–40.
- Zacks, J.M., Ollinger, J.M., Sheridan, M.A., & Tversky, B. (2002), 'A parametric study of mental spatial transformations of bodies', *Neuroimage*, **16**, 857–72.
- Zimmer, H. (1960), 'On the significance of the Indian tantric Yoga', in *Spiritual Disciplines*, ed. J. Campbell (NJ: Princeton University press).