European Sleep Research Society
1972 – 2012

40th Anniversary of the ESRS

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Dream Research

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1) How did it start?
Following the discovery of REM sleep by Eugene Aserinsky and Nathaniel Kleitman, published in 1953, studies on dreaming started to be carried out in sleep laboratories. Two of the founding committee members of the ESRS, Walter Baust (Düsseldorf, Germany) and Uros J. Jovanovic (Würzburg, Germany) studied the relationship between physiological parameters like heart or respiratory rate and dream content, e.g., whether emotionally intense dreams are correlated with higher autonomic arousal, and presented their findings at the first ESRS conferences. Within this context, Michel Jouvet’s (Lyon, France) work with cats that enact their “dreams” during REM sleep (by applying experimental lesions to the brain stem areas responsible for the muscle atonia during REM sleep) should be appreciated. Moreover, while Michel Jouvet contributed to the definition of the distinctive neurophysiological features of REM sleep (which he called paradoxical sleep), he was also fascinated by dreaming and proposed that dreaming corresponds to a rehearsal of instinctual, genetically-programmed behaviours that would preserve the individual’s inherited psychological traits. Complementing these early psychophysiological studies, research looking at cognitive and psychological processes in dreams also emerged within the ESRS. Researchers like Marino Bosinelli (Bologna, Italy), Piero Salzarulo (Bologna, and Paris, France), Carlo Cipolli (Bologna, Italy), and Inge Strauch (Zürich, Switzerland) were particularly interested in dream content and memory processes. Beside dream researchers from Europe two distinguished US researchers, David Foulkes and Milton Kramer presented their dream research at the first ERSR conferences. As the number of dream researchers increased over the years (see “Major achievements”), European dream research has evolved into a stronger position within the scientific community. In 2008, Daniel Erlacher and Michael Schredl set up an open access journal (International Journal of Dream Research, www.ijodr.org) hosted by the library of the Heidelberg University to reflect both the growing interest and research activities in this domain in Europe.

2) Major achievement
Basics of dream research. Research in Europe has addressed a large variety of topics ranging from the definition of dreaming and methodological tools to the psychophysiology of dreaming and clinical aspects such as nightmare treatment. One of the basic questions is whether dreaming, defined as subjective experience during sleep, is always present during sleep. This seems plausible for REM sleep because of the high recall rates from awakenings out of this stage of sleep, while it is less certain for NREM awakenings. Slow wave sleep dreaming has been studied by Corrado Cavallero (Bologna, Italy), who clearly showed that NREM dreaming can be found quite often. Follow-up studies (e.g., Lutz Wittmann, Landau/Germany) showed that brain activation measured by EEG is correlated with dream report length but not dream recall frequency supporting the idea of continuous experiencing during sleep. Dream recall is the prerequisite to the experimental study of dreams and dream research in general, so it is important to identify factors explaining the large inter-individual differences and the intra-individual fluctuations in dream recall. Most of this work has been done by Michael Schredl (Mannheim, Germany) showing that factors like personality (openness to experience), creativity, frequency of nocturnal awakenings, and attitude towards dreams are related to home dream frequency. Nevertheless the major part of the variance remains still unexplained. The most plausible explanation is that dream recall is very sensitive to motivation and attentional factors, i.e., simple encouragements can increase dream recall dramatically. European researchers like Inge Strauch (Zurich, Switzerland), Sophie Schwartz (Geneva, Switzerland), and Michael Schredl (Mannheim, Germany) advanced the method of dream content analysis and applied it to large dream samples. One of the findings was that dreams obtained in the lab or by keeping a dream diary are not as bizarre as is often thought, based on retrospective questionnaires or interviews (outstanding dreams reported long after they had occurred, for example), while dreams do almost never represent true replicates of waking life events. The work of Silvio Scaroni (Milan, Italy) also suggested that cognitive bizarreness might be a shared feature of both dreaming and psychotic mentation.

Psychophysiology of dreaming. The ground-breaking studies of Pierre Maquet (Liège, Belgium) using positron emission tomography showed that brain activity patterns during REM sleep were different compared with those of slow-wave sleep and to waking state. Areas processing emotional information (amygdala) were more active whereas lateral prefrontal areas (associated with planning, reflecting, etc.) were less activated. Although dream content was not reported in these studies, their findings encouraged other researchers to study the interaction between dreamed activities and brain activation patterns or peripheral physiological parameters. Daniel Erlacher (Bern, Switzerland), for example, showed that knee-bends done in the dream are associated with increased heart and respiratory rates. Lucid dreaming (dreams with more reflective activity because the dreamer knows – while dreaming – that s/he is dreaming) is correlated with an increase in prefrontal activation, as demonstrated in an EEG study by Ursula Voss (Bonn, Germany). Most recently, Martin Dresler and his group (Munich, Germany) monitored two lucid dreamers in the MRI scanner and reported that dreamed hand clenching is related to motor cortex activation – even though the study was a pilot encountering various problems because of fragmented REM sleep due to scanner noise and restricted sleeping position. Yet, these studies clearly indicate that the generation of various dreams with their specific

Inge Strauch and Allan Hobson at the sleep laboratory opening at the Central Institute of Mental Health, Mannheim, 1987. (Photo: D. Riemann)
Past – Present – Future

features relies on the activation of many distinct brain networks. Sophie Schwartz (Geneva, Switzerland) pointed out that specific dream characteristics provide unique and valuable information about cognitive and affective processes occurring during sleep. She showed that some bizarre but common features in normal dreams present striking similarities with neuropsychological symptoms observed in brain-damaged patients when awake, suggesting commonalities in functional brain organization. By providing specific predictions about likely patterns of cerebral activity during sleep, dream studies open up a new road for the interpretation of future brain maps of human sleep while shedding light on the varieties of conscious brain states.

**Continuity of waking and dreaming.** In order to approach the question of dream function several researchers thought it is necessary to study what kind of waking life experiences are reflected in dreams. The so-called continuity hypothesis, which postulates that waking life experiences (actions, thoughts, etc.) are reflected in dreams, has been supported by numerous studies. The group of Dieter Riemann and Mathias Berger (Freiburg, Germany), for example, showed that dreams of depressed patients or dreams of patients with eating disorders clearly reflect the patients’ psychopathological symptoms during waking. Studies indicating that sport students dream more often about sports compared to psychology students also support the continuity between waking and dreaming. Similarly, Salzarulo and colleagues (Bologna, and Paris, France) have shown that musicians experience music in their dreams more frequently than non-musicians. Another question pertaining to the continuity hypothesis is whether specific waking-life events are immediately incorporated into dreams (day residue) or after a delay (dream lag effect). Mark Blagrove (Swansea, United Kingdom) demonstrated a dream-lag effect for REM (but not N2) dreams whereby waking-life elements were represented in dreams not immediately but after a delay of about 5 – 7 days.

**Nightmare treatment.** In addition to studying fundamental aspects of nightmares like threats (Antti Revonsuo, Katja Valli, Turku, Finland) or factors affecting nightmare frequency like gender, stress, neuroticism, sex role orientation (Michael Schredl, Mannheim, Germany), two research groups focused on nightmare treatment. Because nightmares (defined as distressing REM dreams which often awaken the dreamer) severely affects sleep quality, these studies combine dream research with sleep medicine. The group of Reinhard Pietrowsky (Düsseldorf, Germany) developed an 8-session intervention based on the Imagery Rehearsal Therapy and showed that this technique is effective for patients with idiopathic nightmares, with posttraumatic nightmares and even for depressed patient with co-morbid nightmares. In order to help a larger group of patients (i.e. stepped care), Victor Spoormaker and Jaap Lanee (Utrecht, Netherlands) developed a self-help program which was effective – even when presented over the internet.

To summarize, taking together the efforts in studying the interaction between dreaming and physiology, dreaming and waking, lucid dreaming, and nightmare, European dream researchers have been highly influential in the field.

3) Where to go?

Since the discovery of REM sleep, the function of dreaming was somehow confused with the function of REM sleep. Yet, whether dreaming fulfills any important physiological or psychological function (be it during REM or NREM sleep) remains an open question. In view of the recent findings regarding memory consolidation during sleep, one wonders whether dreaming is related to memory consolidation. Although the Italian research group led by Carlo Cipolli and Piero Salzarulo (Bologna, Italy) provided some evidence that memory processes are reflected in dreams, it is yet not clearly established whether dreaming about a given task practiced during the day can enhance performance after a full-night sleep.

Recent technological developments (e.g. combined EEG-MRI technology) provide detailed measures of brain activity of sleeping persons and thus open the possibility to study the interaction between neurophysiological processes and dream content in a more precise and thorough way, which is a promising area for future research. Another interesting option is to study, in patients with sleep disorders, the effect of altered sleep physiology on dream content. Initial studies indicate that patients with insomnia or narcolepsy clearly show different dream recall and dream content compared with healthy controls (Michael Schredl, Mannheim, Germany). Another interesting field concerns enacted dreams in parasomnias, such as in sleepwalkers or in patients with REM-sleep behaviour disorder (Isabelle Arnulf, Paris, France; Sophie Schwartz, Geneva, Switzerland). Or to study dream elements which may depart from waking life experiences such as, for example, walking dreams in paraplegics (Isabelle Arnulf, Paris, France) or the visual content in dreams of blind persons (Teresa Paiva, Lisbon, Portugal).

Another promising area of research is lucid dreaming because this type of dreaming can apparently be used by skilled persons to enhance performance in waking life – comparable with the effects of imagining training practice on sports performance. The research done by Daniel Erlacher (Bern, Switzerland) collecting anecdotal data from athletes, together with pilot studies indicate that lucid dreaming could be an important technique to improve performance.

Although the effect of waking life on dreaming has been widely investigated, studying the effect of dreams on waking life has been relatively neglected. We should thus not only consider the negative effects of nightmares on waking life (impairing concentration, affecting daytime mood, etc.), but also the positive effects like creative impulses or insights. The effective use of dreams in therapy has also been demonstrated but research in this area is still in its infancy.

To summarize, the integration of dream research as part of a broader agenda for the understanding of brain and mental functioning seems a very promising field for the future.

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**References**


