## *ENGLISH ABSTRACTS*

### IDENTIFYING THE STONES IN THE PRIESTLY BREASTPLATE

*Zohar Amar*

In identifying the stones in the *hoshen* (breastplate worn by the *Kohen Gadol*), dozens of possibilities have been proposed, beginning with the classical translations, following with the medieval commentators, and continuing with modern scholars. It emerges that there was disagreement even during the days of the rabbinic sages, and there was no unanimous identification. Accordingly, the first part of this article presents the complex methodological aspects of research to identify the breastplate stones, in terms of the problems, premises, principles, and guiding criteria. The set of considerations makes it possible to narrow down the range of possibilities according to their likelihood, based on the historical background, the gemological perspective, and halachic considerations.

The second part of the article proposes two main methods for determining an identification of the breastplate stones. (A) An eclectic approach which examines and chooses each stone identification separately, based on the data and the probability within the limits of the extant information. (B) An approach focusing on one consistent method of identification for the whole. We analyzed a sampling of four identification approaches: the Septuagint (Greek), Onkelos' translation (Aramaic), Midrash Shemot Rabbah (corrupt form of Greek), and translation of Rav Saadia Gaon (Arabic). Of these, the first two translations should be preferred (especially Onkelos), as they are relatively early and close in time to the Second Temple, on the assumption that they preserve at least some of the "memory of the Temple." There seems to be no large discrepancy between them, and they refer to perhaps fifteen types of stones, all of which appear in the Roman Hellenistic literature of the time.

## ESTIMATION OF FUTURE HALAKHIC OBLIGATIONS USING STOCHASTIC PROCESSES

*Lior Dekel and Ely Merzbach*

There are several Talmudic *sugyot* involving economic terms and ideas where mathematical tools of finance could be employed to better understand the issue at the heart of the *sugya*. We focus on the problem of estimating the value of the Ketubah as a model for future uncertain payment. This *sugya* can shed light on similar cases where future payments and time-dependent obligations need to be estimated. We estimate the economic value of a Ketubah being sold to a third party as an option, or as insurance against the risk of having to pay the Ketubah. Stochastic processes and tools from survival theory are used to develop estimation formulae.

## JEWISH AND GREGORIAN CALENDARS – DATE SHIFTING

*Eran Raviv*

5774 is the 17th year in the Jewish calendar cycle; the first half of this year is characterized by the very early dates of the secular Gregorian calendar. An example of this is the fact that Rosh Hashanah 5774 occurred on September 5th; the next time that this will occur will be 76 years later (2089). In various calendars the early occurrence of Rosh Hashanah has been "explained" but a thorough explanation has not been offered, and some of the calendars contain errors.

This paper will review the causes which result in the changes in the relationship of the dates between the Jewish and Gregorian calendars using only analytical tools without any empirical evidence. It is possible to define two factors which are the major causes of the movement between the two calendars; the first is the result of the structure of the Jewish calendar, the introduction of months in leap years and the reasons for additional delays in the start of Rosh Hashanah. The second is the length of the average year in the Jewish calendar, which is different from the length of the average year in the Gregorian calendar. The superposition of these two factors results in the "movement of dates" between the two calendars.

Akin to the 61 Column Table which "maps" the range of the "*molad*" of Tishre of the start of the 19th year in conjunction with the characteristics of the cycle itself,

this paper will use similar methodology to test the "movement of dates" over the course of the 19-year cycle (first cause) and to investigate how the limitations of the starting date of each cycle affect the number of days between the starting date of the cycle and the nth Rosh Hashanah. In addition, this paper will test the number of days (minimum and maximum) in the Gregorian calendar for the same period and this will enable the theoretical calculation of the maximum number of date migration during a cycle.

These results lead to the theoretical possibility of a difference of 30 days in a **single** cycle, however, this extremely rare event will occur only once in ~80,000 years, only in the year 114870 after creation as shown in Table 3 in the body of the paper.

## FIBONACCI SEQUENCE USAGE TO FORECAST DIVERSE POPULATION GROWTH RATES

*Avraham Karsenty*

In the 13th century, the Italian mathematician Fibonacci discovered the series that was named after him when searching for the reproduction rates of rabbits. In these series, except for the two first numbers (1, 1), each one of the other numbers is the sum of the two consecutive numbers before. Also the ratio of two consecutive numbers approaches the value of the famous Golden Ratio called Phi (Φ), an irrational number, holding the value of $\Phi = (1+\sqrt{5})/2 = 1.618...$ The ratio gets more accurate when progressing in series.

As previously demonstrated in-depth by the author, the Golden Ratio, as well as the Fibonacci sequence, appear not only in the dimensions of almost every state of life, but also in both the Written Torah and the Oral Torah. This time we will demonstrate that not only the dimensions of life are built according to those numbers, but also the reproduction rate of wildlife and animals like rabbits and pigeons follow this law.

In the 5th century, Ravina and Rav Ashe compiled all the discussions of the Babylonian Talmud, and it appears that the source of the Golden Ratio of the Fibonacci sequence was already known in Tractate Berakhoth. Furthermore, in Baba Bathra the Talmud studies the reproduction rate of pigeons, and the medieval commentators explain how pigeons reproduce in accordance with the Fibonacci series. Did Fibonacci know the Talmud? Are there more animals that reproduce in

accordance with the Fibonacci ratio?

In this article, we will discuss a number of new points: 1) even Talmudic "numerical axioms" (which are not defined as a scientific discussion) can be explained with a scientific/mathematical approach; 2) the Fibonacci sequence discovered in the 13th century was well known in the Babylonian Talmud and in the Mishnah centuries earlier; 3) not only rabbits but also pigeons reproduce in accordance with the Fibonacci sequence.

## 'SHA'AR HAMAIM' ('WATER GATE') IN ANCIENT JERUSALEM: AN INTERDISCIPLINARY RESEARCH MODEL FOR ANALYSIS OF JEWISH SCRIPTURES TO CONFIRM THE CONCLUSIONS OF ARCHEOLOGICAL FINDINGS

*Daniel Raviv*

This article introduces an interdisciplinary research model that deals with the interaction between two types of knowledge sources that both aim to achieve historical truth: Jewish scriptures (Biblical and rabbinic literature) and archeological findings. The present study has a double purpose: the study of 'Sha'ar Hamaim' ('water gate') in ancient Jerusalem and the creation of a research model that allows for the analytic integration of the two types of knowledge sources. The interaction between these sources enables an optimally productive research process, resulting in a comparative inquiry that examines their different characteristics as well as the interaction between them in their common purpose of achieving historical truth. One of the main conclusions is the important role of the archeological finding in prompting a thorough and deep analytic review of the relevant Jewish scriptures, thus contributing to the quest for and the revelation of historical reality.

## SELF-IMAGERY, HASIDISM AND COGNITION

*Daniel Reiser*

Rabbi Kalonymous Kalman Shapira (1889-1943), the Rebbe of Piazecna, and Rabbi Menachem Eckstein, a Dzików Hasid (1884-1942), were deeply involved in developing a Hasidic practice of psychological-personal guided-imagery. Both of these important twentieth-century thinkers also offered self-imagery exercises in which the subject is required to imagine himself, which were aimed at achieving a number of goals.

Autoscopic phenomena are defined in cognitive science as illusory visual experiences during which the subject has the impression of seeing a double of his own body in an extrapersonal space. That is, the subject sees his own body – before him. Using the various models of autoscopic phenomena presented in cognitive science allows us to deepen our understanding of the exercises developed by Rabbis Shapira and Ekstein, and illustrate the differences between them.