more research needs to be done in this area

In the bibliographic analysis of scientific output on

Scientific collaboration is without a doubt a hallmark of modern science.

Price (1963) stated that by the end of the twentieth century individual research

would be gone and collaboration the norm, predicting a collaboration

rate of 2.5 authors per paper. Even though the rate of collaboration has

increased significantly in the experimental fields, the Humanities and social

sciences, in general, are still far from attaining Price’s rates (Over, 1982). In any case, collaboration is an indicator of the degree of professionalization of a scientific community (Sancho, 1990) and of the economic support the science

receives, since such investment usually serves to promote the formation

of teams (Agullo Martinez and Aleixandre Benavent 1999.)

If

the bibliographic indicators provide information regarding the size, growth,

development, visibility and structure of the research process (Agullo Martinez,

1998; Bordons and Zulueta, 1999; Maltras Barba, 2003; Terrada, 1971,

1973), the indicators of production, based on the measurement of scientific

output (Lopez Pinero and Terrada, 1992), will reveal concrete features such

as the growth of the science and the chronological development of scientific

output, and also the productivity of researchers, their degree of collaboration

and cooperation among institutions.

Material and Method

Since there is no single referential data base bringing together all the papers

published in the field, we have been forced to consult several sources

of information. As such, the following resources have been consulted:

Search terms specific to the field of cave art, such as “rock art,” “cave

art,” “Levantine art,” “Levantine painting”, “Schematic art” and “Schematic painting”1 were used to query the catalogues and the national and international databases cited. These terms were used to retrieve documents held in Subject, Title, Summary fields. When nothing was retrieved, the Any Field

option was used.

Our work, performed on the basis of the methodology proposed

by Pao (1985) and Nicholls (1986), has verified “Lotka’s Law.”

We have also calculated the productivity index proposed by Price (1963)

on the basis of the logarithm decimal of the number of publications by authors.

This allows us to define productivity groups of low, medium and elite

authors, using the productivity index of an author whose position in the distribution

of authors corresponds to the square root of the total number of authors.

We have also calculated the “transitory index” (closely associated with

the productivity index), defined as the number of authors who publish only

one paper (Price and Gursey, 1976). This index allows us to weigh the degree

of maturity of the scientific field and its consolidation as an area of study.

In our case, however,the general lack of references to citations and the concomitant absence from citation indexes in question (because Spanish journals are not indexed in international data bases) invalidates this approach.

**Data Analysis**

The 2,186 documents analyzed were produced by 846 authors. Of these 484

have published a single work, and account for 57.21% of the author sample.

Another group of 130 (15.36%) authors has published two works and 63

(7.44%) authors have published three works, while 29 (3.42%) share credit

in four articles, and 19 researches (2.24%) share credit in up to five works.

This trend continues until we reach a subset of highly productive authors,

“super-productive” in the words of Martinez Fernandez (1996). This group

is comprised of twelve authors (1.41%) who have published 40, of which

there are two authors having signed 92 and 93 works, respectively, and one,

Antonio Beltran Martinez, with 179 publications.

*Table 1.* Distribution of works by author

Works Authors % authors

1 484 57.21

2 130 15.36

3 63 7.45

4 29 3.43

5 19 2.24

6-10 57 6.74

11-15 23 2.72

16-20 12 1.42

21-25 9 1.06

26-30 6 0.70

31-35 1 0.11

36-40 3 0.35

41 10 1.18

Total 846 100

The participation of foreign authors in the research of post-Paleolithic cave

art in Spain and the appearance of Spanish authors in foreign publications

constitute the most reliable indicators for assessing the degree of internationalization

of the field.

research on cave art in Spain at that time was largely

in the hands of foreign institutions such as Instituto de Paleontologia Humana

de Paris. Spanish institutions such as the Comision de Investigaciones

Paleontologicas y Prehistoricas, often incorporated foreign researchers, including

those already mentioned.

The few Spanish authors, associated with fields as disparate as Natural Sciences or Fine Art played for the most part a complementary role, and it should be remembered that the field of prehistory and archeology hardly existed at all in those years in Spain.

The 82 Spanish authors who have published outside of Spain (9.69%) account

for 125 works, which constitutes 60.97% of the output published

abroad and only 5.71% of the total output.

The number of Spanish authors published in foreign publications is scant

over the first fifty years of the study period. In fact, the few works we found

are co-authorships with foreign lead authors who dominated the scene at the

time, especially Henri Breuil and Hugo Obermaier.

1950s we find a greater number of authors, including authors signing work

individually. This trend hit a peak, in the ten year span of 1961-1970, in fact

tripling the number of published works in the previous decade. The last

twenty years has seen a greater number of Spanish authors published in foreign

publications, though they still account for very low percentages of the

total output. While the growth of foreign authors publishing in Spain in this

field might suggest a shifting trend, we cannot assert the same with regard

to Spanish authors publishing abroad. Only another study with a broader

time span that the last twenty years would verify what appears to be a line of

growth or, as warranted, show the opposite.