

**WOMEN IN THE ORGANIZATIONAL  
CONTEXT OF R & D**

Neusa Maria Bastos F. Santos

Professor of Administration at Graduate Programs of

Methodist University of São Paulo - UMESP and

Pontifical University of São Paulo - PUC-SP

Rua Prof. Lúcio Martins Rodrigues 330 ap. 12

05621-030 São Paulo, SP - Brazil

Phone: (5511) 846-6659

Fax: (5511) 871-1416

e-mail: [admneusa@exatas.pucsp.br](mailto:admneusa@exatas.pucsp.br)

## ABSTRACT

This paper has two main objectives. The first one is the investigation of the organizational climate profile in some Brazilian governmental research institutions as perceived by female and male members of their high-level technical staff. The second objective is to find out the influence of SEX variable on the perception of the climate.

The development of the method employed for measuring organizational climate has been based on Kolb's Scale with its seven factors. The questionnaire used includes 21 items representing the content of the seven factors of Kolb's Scale and was filled out by the respondents themselves.

A total of 449 respondents from 12 research institutions, directly involved with the respective administration, filled out the questionnaire.

The multivariate variance analysis model was employed to analyze the data. The computer program SPSS was used as a support of the statistical techniques utilized.

The results of the investigation indicate that SEX variable influence to a significant degree ( $p < 0.05$ ) the perception of the organizational climate, concerning to factors like **responsibility, reward, ganizational clarity** and **support**.

## I. INTRODUCTION

Organizational climate is a concept of esteemed importance describing the perceptions and feelings of persons with relationships to organizations, groups and the tasks in which they are involved. The study of organizational climate unites a combination of specific attributes that

characterize a particular organization and that will reflect the manner in which a business deals with its collaborators, thus influencing the behavior of individuals.

Schneider and Hall (1972) contributed in a significant manner, through their work and research, to the literature of organizational climate. The authors define organizational climate as:

"... A generalized perception that the individuals forms of an organization, and that results from experiences lived by him in this environment..."

Litwin and Stringer (1968) were the first researches to occupy themselves with the concept on organizational climate, whose definition will be adopted in this work, that is:

"... A combination of measurable properties of the work environment, perceived directly or indirectly by the individuals that live and work in this environment and that influence the motivation and the behavior of these persons".

The object of this research is to investigate the influence of some variables of reference, as for example sex, in the perception of the organizational climate, in a sample of Research Institutions for Direct Administration of the State of São Paulo.

The intrinsic motivation that stimulated one to propose this study originates from two justifying principles. The first is given by the importance that the organizations of R&D assume in the society, by their role of amplifying the frontiers of human knowledge and also for collaboration in the solution of innumerable problems that in reality touch everyone. The second is due to the incontestable contribution that researchers, men and women, bring to this larger process, which passes, in part, from the fact that they insert themselves in and perceive the work environment of institutions to which they belong.

The environment of R&D becomes a campus for extremely rich research in which the analysis and future studies of organizational climate, of more academic nature, can be effectuated. The high degree of challenge inherent in the work of R&D is one fact that is difficult to find in such magnitude

in other organizational contexts. If an R&D organization cannot take advantage of this opportunity to channel the motivational needs of persons, it will convert this strength into a grave deficiency that, certainly, will undermine the creative capacity of the technical body, as well as detract from organizational obligations of the highest level.

Seeking a better understanding of the data presented here the following operational definition should be considered:

**1. Research and Development Institutions (R&D)** - Organizations that dedicate themselves fundamentally to scientific and technological innovations, constituted primarily of Universities, Research Institutions and Technology Centers of Business and Industry. We will focus on R&D entities which are referred to as Research Institutes (RI's) of governmental nature identified by law number 125 of 11/8/75, that created the profession of scientific researcher.

**2. High Level Technical Members** - Human resources in RI's are basically divided into three categories: auxiliaries, medium level technicians and scientific and technical personnel. It is in this last class that we find technical researchers of high level who are directly involved in research and in the administration of research.

**3. Position Occupied** - Divided in four groups:

**a. Directors\Coordinator** - Makes reference to the persons that act as technical directors of the Department, Division or Service, or to the Director of Research.

**b. Chief\Person in Charge** - Makes reference to Chiefs of the Technical Section or person in charge of the Technical Section.

**c. Researcher** - The person responsible for the development of scientific investigation activities such as applied research, tests, analysis, etc.

**d. Technical Advisor** - The person who gives support and advice to the Coordinator and to the Technical Director of the Department.

In general, positions a, b, and d are characterized by activities done in the exercise of the administration of research (technical management or administration).

**4. Sector of Activity** - Effectively divide in four areas:

**a. Health** - Including Institutions Adolfo Lutz, Pasteur and Health.

**b. Natural Resources** - Including Botanical, Geological, Fish and Wildlife Institutions.

**c. Aviculture** - Including Agricultural, Biological, Food Technology and Zoological Institutions.

**d. Economic Agriculture** - Including the Institute of Economic Agriculture.

## II. METHODOLOGICAL ASPECTS

With basis in the object of this study, that is to investigate the influence of the sex variable in the perception of organizational climate of the Research Institutions, what follows are the principle topics that constitute the methodological framework:

### 1. Establishment of the Basic Hypothesis

**H1:** There exists a difference in perception of the factors of organizational climate of IP's between individuals of different sexes, or for the high level technical personnel of the male group and the female group.

The null hypothesis is that there does not exist an effect of sex in the perception of the factors of organizational climate of the Research Institutions.

Therefore, the rejection of the null hypothesis or statistic ( $H_0$ ) will involve the acceptance of the basic hypothesis confirming, in this form, the influence of the variable of reference in the perception of climate. As to the level of significance for testing the hypothesis, it was decided to fix the level of significance at 5% (five percent), or, ( $p < 0,05$ ). This level has been, reliably, one of the most utilized in the socio-behavioral area.

## **2. Research Plan**

The universe of the Research Institutions for Direct Administration of the State of São Paulo was defined as being  $N = 14$ , but involved in the project were only twelve of these entities, from which proceeded the survey data, for the determination of the number of high level technicians allocated in each Institute.

To obtain information, personal contact was made by the researcher with the person responsible for each of the 12 organizations. From the total of attendants ( $N = 8.506$ ) approximately 14% of the population corresponded to high level technician ( $N = 1.210$ ). From these elements, those that functioned in the profession of Scientific Researcher corresponded to 53% ( $N = 645$ ). The choice of high level technicians selected for the research was defined from the moment in which each institution decided that its member could be researched. In this manner, in nine of the twelve institutions, practically the whole population of the referent category was included, or a total of 637 technicians from 683 possible. This small variation is justified due to certain elements that were absent for reasons of holidays, permission, courses outside the institution, services in other Secretaries, etc., during the distribution of the questionnaires.

For the remaining three institutions a stratified sampling was used, equivalent to 20% of the population, because in this group the Management of the respective institutions opted for this alternative. Here, a chance lottery was used, using a listing obtained from each entity, that contained

the nominal relation of high level technicians and the situation of each one in relation to profession. The technique used resulted in 105 elements chosen by lot. Hence, from the total number of high level technicians ( $N = 1.210$ ) 742 subjects were selected (61.3%), of which 637 corresponded to the RI's 100% surveyed and 105 to the RI's 20% surveyed. The number of persons that, effectively, participated in the survey was  $N = 449$ . In the last column of illustration 1 can be found the percentage of the return of questionnaires that, in mean, was equivalent to a 60% return.

### Illustration 1:

#### Composition of the sample surveyed

Institutes 100% sampled	Total of high level technicians	Technicians selected for the study (total)	Technicians who actually took part in the study (total)	% of returned questionnaires
Adolfo Lutz	166	163	68	41.7
Pasteur	6	6	6	100.0
Health	62	62	35	56.5
Botanical	65	60	31	51.7
Fish	82	82	46	56.1
Geological	13	13	7	53.8
Wildlife	80	80	52	65.0
Food Technology	93	81	48	59.3
Zoological	116	90	74	82.2
<b>Sub-Total</b>	<b>683</b>	<b>637</b>	<b>367</b>	-
<b>Institutes 20% sampled</b>				
Economic Agriculture	87	17	16	94.1
Agronomical	240	48	37	77.1

Biological	200	40	29	72.5
<b>Sub-Total</b>	<b>527</b>	<b>105</b>	<b>82</b>	<b>-</b>
<b>Total</b>	<b>1210</b>	<b>742</b>	<b>449</b>	<b>60.0</b>

### 3. Instrument and Data Collection Procedure

A structured questionnaire was the basic instrument for the collection of data about organizational climate in RI's.

The seven environmental factors of the Kolb Scale (1978) were used as a first step in the construction of this instrument. The motive for this preference was based in its prior use, here in Brasil, in the field research of Souza (1977, 1978, 1980 a 1980 b), Haetinger (1979), Bona (1981) and Ritcher (1982).

The Kolb scale is constituted of 7 factors that include the following dimensions:

- 1. Conformity with norms** - the degree in which the members feel that many rules, procedures, directives and practices exist that have to be followed, removing the freedom of doing work as they think it should be done.
- 2. Responsibility** - the degree in which the organization attributes responsibility to its members, giving them autonomy to make decisions and resolve problems without the need of verifying each step with their superiors.
- 3. Standards of performance** - the emphasis that the organization puts on the quality of performance and on high production, including the degree in which the members of the organization feel that the entity establishes and communicates stimulating objectives.
- 4. Rewards** - the degree in which members feel that they are also recognized and compensated for good work, and not only criticized or punished when something goes wrong.



**5. Organizational clarity** - the feeling among the members that things are well organized and objectives are clearly defined as opposed to being disordered, confused or chaotic.

**6. Support and human warmth** - the feeling that friendship is a valuable norm in the organization; the members trust each other and offer, between themselves, mutual support. The feeling that good relations prevail in the midst of the work environment.

**7. Leadership** - the degree in which the organization recognizes and stimulates leadership from members actually qualified. Individuals feel the freedom to assume leadership roles and are rewarded for successful leadership.

Later, the seven factors of the Kolb Scale were distributed in a set of 21 questions, which resulted in the association of 3 questions for each of the respective factors. The numbering of these questions was randomized in order to not influence responses.

Each item of the questionnaire was responded to by each individual researched, according to the idea of the **actual** (what you believe happens, now, in your organization) and the **ideal** (how you would like it to be). An ordinal scale of 4 points was used, that sought to reproduce the actual and ideal conditions of the situation, according to the opinion of the respondent. Each value varying from 1 to 4 respectively: never, rarely, frequently, always.

A pre-test of the questionnaire was done with a group of participants from a Training Program in Research Administration, in FEA\USP, with the objective of correcting possible errors in the instrument that could create misinterpretation or misunderstanding of the questions formulated. This group was chosen due to the fact that the majority of them exercised technical or administrative responsibilities in Research Institutions.

#### **4. Statistical Formulation of the Model**

In order to effect this study, though the results of operations were done with ordinal variables, the score obtained for each climate factor could be treated as a quantitative variable, of interval type. Thus, in order to test the research hypotheses, we should investigate the behavior of the vectors formed by the factors F1,....., F7, while separated by the different levels of variables of interest, sex and responsibility. The means calculated are indicators of possible differences between levels. Each factor could be tested separately or, having dependency between them, suggest a combined analysis. Among the various statistical techniques employed for this, one is the Multivariable Analysis of Variance (Morrison, 1976). The statistical formulation of the model is given below.

$$Y_{\sim ij} = u_{\sim} + a_{\sim i} + E_{\sim ij}$$

where:

$Y_{\sim ij}$  : is the vector of means of j submitted to the i level of A (\*).

These means correspond to the values that the Kolb factors assume for each individual.

$u_{\sim}$  : is the vector of the means of the Kolb factors.

$a_{\sim i}$  : is the vector of the i level of A(\*)

$E_{\sim ij}$  : is the vector of the unobservable errors.

(\*): "Levels of A" will have different meanings. In this case there are two possible levels, that is, male and female.

### **Supposition**

$$E_{\sim ij} \sim N_7(0_{\sim}, \Sigma)$$

where:

$N_7$  = normal distribution of the 7 relative variables of the factors of the Kolb Scale.

$0_{\sim}$  = vector of the means equal to zero.

$\Sigma$ = matrix of the variance and covariance.

### III. ANALYSIS AND DISCUSSION OF THE DATA

The masculine population is the majority (62.1%) when compared to the female (38%), as demonstrated in table 1. Analysis by sector indicates that the largest concentration of women researched are in the area of Health (73.4%) in contrast to Aviculture and Natural Resources where the majority, in terms of percentage, are men, 76.6% and 72.8% respectively.

The research also indicated a much smaller concentration of women in positions of administration or management of research, equivalent to 10% of the total female population sampled (N = 170), according to the data in table 2. In the area of research, the number of female researchers is larger, revealing a percentage of 90% (N = 153) as opposed to 65% represented by the male sex (N = 182).

**Table 1**

#### **SAMPLE DISTRIBUTION ACCORDING TO SEX AND SECTOR**

<b>Sex</b>	<b>Men</b>		<b>Women</b>		<b>Total</b>	
<b>Sector</b>	<b>Subjects</b>	<b>Frequency</b>	<b>Subjects</b>	<b>Frequency</b>	<b>Subjects</b>	<b>Frequency</b>
Health	N=29	26.6%	N=80	73.4%	N=109	100.0%
Natural Resources	N=99	72.8%	N=37	27.2%	N=136	100.0%

Aviculture	N=144	76.6%	N=44	23.4%	N=188	100.0%
Economic Agriculture	N=7	43.8%	N=9	56.2%	N=16	100.0%
Total	N=279	62.1%	N=170	37.9%	N=449	100.0%

**Table 2**

**SAMPLE DISTRIBUTION ACCORDING TO SEX AND POSITION OCCUPIED**

<b>Position</b>	<b>Men</b>	<b>Women</b>	<b>Total</b>	<b>Frequency</b>
Coordinator and Director	N=24	N=1	N=25	5.6%
Chief and Manager	N=60	N=14	N=74	16.5%
Researcher	N=182	N=153	N=335	74.6%
Technical Assistant	N=13	N=2	N=15	3.3%
Total	N=279	N=170	N=449	100.0%

Among respondents, 74.6% occupied the position of researcher in which they performed activities oriented by the institution (basic research, applied research, tests and analysis, applied technical assistance, etc...). The majority of members, 25.4% are distributed in those positions that involve the individual in the administration of research.

**Test of the Hypotheses**

With the aid of statistical programs, tables for the Multivariable Analysis of Variances were constructed in order to test the hypotheses. With these, the researcher sought to test if the means obtained for each climate factor differed significantly in terms of sex.

Illustration 2 gives a general idea with respect to the results obtained with the statistical analysis. The first column of the illustration indicates the null hypothesis to be tested. The second column shows the value in percentage, assumed by the descriptive level of the tests of the hypothesis, or, the level beyond which they are rejected. The last column describes the conclusions for the research hypothesis, to the level of significance of ( $p < 0,05$ ). For values less than 5%, obtained for the levels described, the null hypothesis was rejected and for values more than 5%, the null hypothesis was accepted.

In summary, we can affirm that the hypothesis was rejected to the level of significance of 5%. This means that to this level the hypothesis of the study was confirmed, or that sex had an affect on the perception of climate. The influences exerted by the sex variable was significant once the value encountered for the descriptive level of the test of this hypothesis was the smaller, or, 0,00%.

### Illustration 2

#### VERIFICATION OF THE RESEARCH HYPOTHESIS

Null hypothesis to be tested	Descriptive level of the hypothesis test (in %)	Conclusions for ( $p \leq 0,05$ )
H01 : there is no sex effect	0.00	H01 is rejected, therefore there is difference in the perception of the IP between persons of different sexes

The result that the variable of study, sex, interferes with the perception of climate is elaborated in illustration 3 that identifies, with a base in statistical data, the factors over which this influence is exerted. In this sense, the level of significance adopted was 5%, but, considering that 7 tests were done (one for each factor), the level of significance for each test will be 0,71% (5% divided by 7). As such, when a value of the described level obtained for each factor was less or equal to 0,71%, the hypothesis corresponding to the factor was rejected, evidencing itself by this

form, the effect of the variable studied in the factor considered. Thus, it can be concluded that for  $< 0,71\%$ , **the sex variable for responsibility factors, reward, clarity and support and human warmth**, had descriptive levels of respectively **0,00%, 0,03%, 0,13% and 0,10%**. For the other factors such as conformity, patterns of performance and leadership the effect of the sex variable was not verified.

### Illustration 3

#### DESCRIPTIVE LEVELS, IN PERCENTAGE, OF THE TEST OF EQUALITY OF MEANS OF THE STUDY VARIABLES

Variables of Study	Factors of the organization climate						
	Conformity	Responsibility	Patterns	Rewards	Clarity	Support and warmth	Leadership
Sex	16.33	0.00	37.72	0.03	0.13	0.10	1.22
	no effect	has effect	no effect	has effect	has effect	has effect	no effect

It is opportune to point out that while to the level of significance combined of 5% the results of the research indicate that there exists an effect of sex on the perception of climate to the factors **responsibility, reward, clarity and support and human warmth**, the influences most significant verify, nevertheless, the level of attribution of responsibility and rewards. For these factors the descriptive levels assume respectively values equal to 0,00% and 0,003%.

With the end of reflecting better on this evidence, table 3 was constructed to take into account the scores obtained in the evaluation of the real and ideal climate, portrayed by women and men. The difference refined between the scores for organizational climate desired (ideal) and organizational climate perceived (real) are indicators of the degree of dissatisfaction gained with relation to the different climate factors studied.

**Table 3**

**PATTERNS OF MEANS AND DEVIATIONS OF THE DIFFERENCES BETWEEN REAL  
AND IDEAL ORGANIZATIONAL CLIMATE BY SEX**

<b>Factors of Climate</b>	<b>Male</b>		<b>Female</b>		<b>General</b>	
	<b>Means</b>	<b>Deviations</b>	<b>Means</b>	<b>Deviations</b>	<b>Means</b>	<b>Deviations</b>
Conformity	1.7	2.1	1.4	2.4	1.6	2.2
Responsibility	2.9	2.1	4.0	2.2	3.3	2.2
Performance	4.1	2.2	4.3	2.2	4.2	2.2
Rewards	4.6	1.9	5.3	2.0	4.9	2.0
Clarity	3.7	2.1	4.3	2.1	3.9	2.1
Support and Warmth	3.9	2.1	4.6	2.1	4.2	2.1
Leadership	3.6	2.3	4.1	2.4	4.2	2.4

Taking as a base the data presented in table 3, what can be inferred, from the mean differences between the scores of actual and ideal climate, is that men present a larger indice of satisfaction with relation to almost all the scale factors. Exception is made to the item **conformity with norms**, that obtained the least general mean (1.6), indicating a certain satisfaction of both the sexes with relation to the existence of rules, norms and existent organizational procedures, in the RI's studied, for task orientation. For this factor, the female mean was of 1,4 and the masculine 1,7. Figure 1 illustrates the profile of dissatisfaction with the climate obtained from individuals of both sexes. The masculine sex perceived, significantly, a more positive real climate within institutions

when compared with the female sex, principally with relation to responsibility, perceived extrinsic rewards (salaries), intrinsic rewards (opportunity for growth and personal development) and support and human warmth.

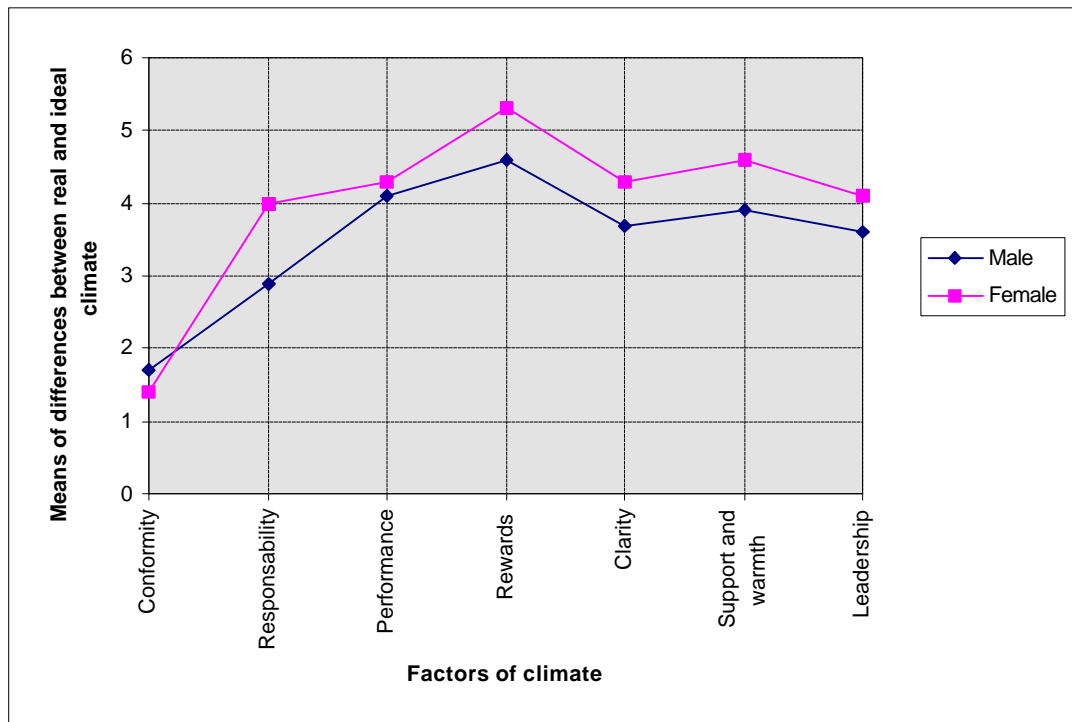
The reward factor is what shows the largest median indice of discontent for the two sexes, with a median equal to 4,9, while the female score reached for this factor was the highest among all (5,3). If the class as a whole did not indicate such dissatisfaction, larger factors could be seen to justify this situation. One example of this could be the politically established salary, established by the government, for payment of persons allocated for research in institutions of Direct Administration.

After rewards, the climate factor which obtained the largest median difference was support and human warmth, also for the female population (4,6). The motive of affiliation portrayed in function of the factors of reward and of support and human warmth, revealed in this study, the largest indices of female dissatisfaction. As such, it can be concluded that women exhibit low indices of motivation for affiliation in the RI's studied. They feel poorly recognized and not secure with relationship to friendship, confidence and human support encountered in their organizations.

**Figure 1**

**OUTLINES OF DISSATISFACTION OF ORGANIZATIONAL CLIMATE  
CONFORMING TO SEX**





In that survey, the female population represented, statistically, considerably less than the masculine population, respectfully 37,9% and 62,1%. Perhaps by percentage, in general, the minority group in the Institutions, the women would like to be more supported and rewarded in their work environment, judging also that they are not being stimulated to assume more important responsibilities. Besides this, they feel the need for more clarity in the definition of organizational aims and objectives. It serves to remember that, in relation to the responsibility factor, table 2 points to the female presence in all positions performed by men, inclusive of the direction of the institutes, actualizing the orientation and administration of scientific research. Nevertheless, the masculine proportion in these cases is always larger. Besides this, they feel the need for greater transparency and clarity in the definition of institutional goals and objectives toward better insertion in the organizational context.

#### IV. IN WAY OF CONCLUSIONS

In synthesis, the results of this research make possible the empirical evidencing of the effect of certain attributes of organizational climate in institutions of research of Direct Administration of the State of São Paulo. To one level of significance of  $p < 0,05$ , it can be concluded that there exists differences in the perception of climate for individuals of different sexes. In general, men perceive the organizational climate in these RI's in a more favorable form. For  $< 0,71\%$  it can be statistically inferred that the most significant influences of the sex variable were evidenced to the following factors of climate and their respective descriptive levels:

- responsibility (0,00%)
- rewards (0,03%)
- organizational clarity (0,13%)
- support and human warmth (0,10%)

The question that appears to need raising here is the reason why women, in general, are not reaching full realization of their professional ideals in this type of culture related to scientific investigation. Two hypotheses can be ventured, even though causes of the problem are not part of the object of this study. The first is a possible process of discrimination against women. Studies of this nature, indicating that the scientific community creates obstacles and difficulties for the actualization of women, are explored by Tosi (1975, 1981), Barroso (1975a e b), Richer (1982) and others. An excellent work by McGrayne (1995) tells the history of women that won the Nobel Prize in Science.

The second hypothesis suggested for future academic exploration is the professional posture of woman in the work environment. As Souza (1982) affirms "it is important not to forget that the organizations, each with its mission, technology and personal image, attract individuals that synchronize with it". In this ultimate affirmation we understand that the factor of integration requires

balanced doses of the search for competence and the capacity for competition, taking into account the political, technical and cultural context of the organization. To be alert to this important condition of competence and competition will certainly bring the professional woman to collaborate in the full attainment of the goals of the institution, and ultimately in her own. Many times to assume the role and the responsibilities of being a woman, mother and scientist is not easy, but this overcoming of challenges brings optimistic messages for those who pass through the experience. In a recently published work, Moreno and Blasques (1995) evidence these womens realities, affirming:

"... When they decided to travel the path considered to be for men, they did not always encounter a gentleman that extended them a hand. Still, they sought the trails and overcame the difficulties with dedication, creativity and much talent. Besides their brilliance, many women scientists...do not have the recognition due them... only twenty percent celebrate the challenge of having arrived at the top of their profession... In the day to day of research, nevertheless not all have time to give heed to the differences. Even with different opinion these women bet on the future with optimism." Therefore, to work...

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