

## A Tribute to Mohammad Reza Darafsheh

*Ali Reza Ashrafi\* and Khadijeh Fathalikhani*

### Abstract

The decision to pay tribute to Mohammad Reza Darafsheh is for his major contributions to finite group theory in Iran and through scientific endeavor, publishing several papers in this topic and his action as an editor of a number of scientific journals.

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## 1. Introduction

Mohammad Reza Darafsheh was born in Abadan in 1950 and passed his high-school in Masjed Soleyman. He showed his intelligence in mathematics from that age and became the top student in the final exam of the high school in 1969. In that year, he also won the first score in the entrance exam of the University of Tehran in mathematics. In 1973, he finished his bachelor with becoming the top student. Then, using the scholarship of the Iran's ministry of science, he went to England to pursue M.Sc. and PhD degrees. He received his M.Sc. in 1975 and PhD in 1978 from the University of Birmingham. After finishing PhD, he came back to Iran and was employed by the University of Jondishapour in Ahvaz in 1978. In 1979, he was the dean of the faculty of mathematics for one year. Furthermore, he had taught at the Abadan Institute of Technology in Abadan for two years.

In 1989, in order to be engaged in the PhD program, he applied to the faculty of science of the University of Tehran which had been recently established. Then,

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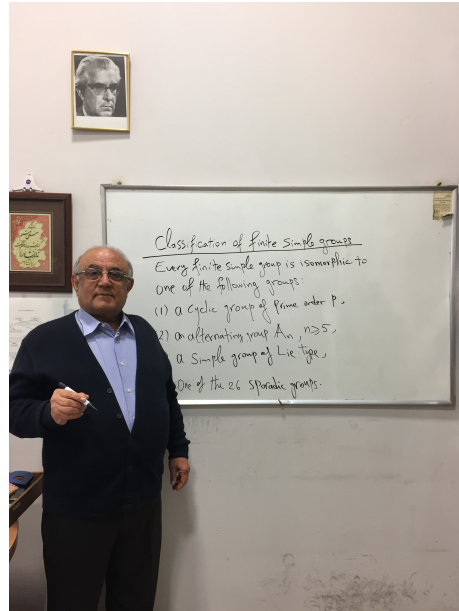
\*Corresponding author (E-mail: ashrafi@kashanu.ac.ir)

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Mohammad Reza Darafsheh in 2019.

he became the responsible of the higher education of the math department of that university. From 1995 to 1999, for four years, he was the head of the department of mathematics of the University of Tehran. Then, in April 2003, he became the assistant of the administrative and financial affairs of the faculty of science.

Darafsheh he has published more than 190 papers in scientific journals so far. He has written 5 books and has also translated 4 books to Persian. One of his books entitled “An Introduction to Group Theory” has been chosen as the best book by the Iran’s Ministry of Science. Moreover, his book “Algebra” in 3 volumes published by the University of Tehran Press in 1390, has been selected as the book of the year by the University of Tehran Press and has also been called one of the “eighty treasures” of that university

In 1990, he won the Abdus Salam prize. He also won the Kharazmi prize in 1997 and has been appreciated by the president at the time. Darafsheh has been introduced as the outstanding professor and as the top researcher of the University of Tehran. Moreover, Darafsheh has been the editor-in-chief of the Bulletin of Iranian Mathematical Society and a member of the executive committee of the Iranian Mathematical Society. Furthermore, he has been a member of several outstanding international mathematical societies, a member of the editorial board of the international mathematical journals, a senior dependent member of the Abdus Salam international center (ICTP) and a member of the scientific committee of different conferences. He has also been keynote speaker in many conferences.

Darafsheh has taught and has done researches at Yale University (twice) and

North Carolina University (three times) on his sabbaticals. Finally, it should be mentioned that 34 PhD students and 65 master students have been educated under his supervision.

## 2. History of CGT in Iran Till 1990

In this section a history of Computational Group Theory (CGT) in Iran and a review of the most important works till 1990 is presented. We believe that the computational group theory is basically developed in the country by two Iranian mathematicians: Mohammad Reza Darafsheh and Jamshid Moori.

Darafsheh holds an important place in Iran for his efforts to develop CGT in the country. His interests go beyond this subject. He has done some research on character theory, characterization of finite groups by the set of element orders, symmetry classes of tensors, Cayley graphs, block designs, abstract finite groups, etc. Based on the information given by Mathematical Reviews, there are nine papers by Iranian authors in CGT published in national or international reputed journals before 1990. The author of the papers [3–8] is Darafsheh and the papers [9–11] are written by Moori. In what follows, we explain these works in chronological order based on their publishing dates.

The oldest paper in CGT written by Iranian authors is one published by Jamshid Moori in the Journal of the London Mathematical Society [11]. In this paper, Moori studied a group  $G^+$  of the form  $2^{10}M_{22}$  and its automorphism group  $\bar{G}$  which is of the form  $2^{10}Aut(M_{22})$ . Both of these groups can be written as the semi-direct product of two groups such that one of them is an elementary abelian 2–group of order  $2^{10}$  and the other one is isomorphic to the Mathieu group  $M_{22}$  or its automorphism group. Furthermore, some information are given by which it is possible to calculate the character tables of the Mathieu group and its automorphism group. Moori has also computed the character table of the automorphism group of the simple group  $D_4(2)$  in 1983 [10].

In 1984, Darafsheh took the largest Conway simple group  $Co_1$  of order  $2^{21} \times 3^9 \times 5^4 \times 7^2 \times 11 \times 13 \times 23$  into account [8]. He used a list of subgroups of  $Co_1$  containing all 2-local subgroups obtained by Curtis in [1] and considered the maximality of the 2-local subgroups of  $Co_1$  to prove that there are only five conjugacy classes of such subgroups. In the same year, Darafsheh determined all maximal subgroups of the simple group  $GL_6(2)$  of order  $2^{15} \times 3^4 \times 5 \times 7 \times 31$  and proved that this group has exactly seven isomorphism types of such subgroups, see [7] for details.

In 1985 Darafsheh studied the action of the group  $GL_n(2)$ ,  $n > 2$ , on the set of all nonzero vectors of the vector space of dimension  $n$  over the field  $GF(2)$ . He also considered another action of the same group on the set of all ordered pairs  $(v, V)$ , where  $V$  is a hyperplane and  $v$  is a point outside  $V$  [6]. He proved that the first action is doubly transitive, but the second one is only transitive. Furthermore, if  $\chi$  is the permutation character of the first action and  $\psi$  is the permutation character of the second action, then he proved that  $\psi - 2\chi + 1 = \alpha + \beta$ , where

$\alpha$  and  $\beta$  are irreducible characters of  $GL_n(2)$  of degrees  $\frac{1}{3}(2^{n-1} - 1)(2^{n-2} - 1)$  and  $\frac{1}{3}(2^n - 1)(2^{n-1} - 1)$ , respectively. These results are in a paper published in the Journal of Pure and Applied Algebra and some of them were extended to the general linear group  $GL_n(q)$  in 1987 [4].

In 1986, Darafsheh calculated all sixty irreducible characters of the finite simple group  $GL_6(2)$  [5]. The ordinary irreducible characters of the automorphism group of this group were calculated in 1987 [3]. Let us now mention that in 1987 there is a paper in CGT written by Jamshid Moori in which the author applied the Atlas of Finite Groups [7] to compute generators for the group  $C_{F_{22}}(x)$ , where  $x$  is a representative for one of the three  $Aut(F_{22})$ -classes of involutions in  $Aut(F_{22}) \setminus F_{22}$ .

Nowadays, group theory is an active research topic in Iran. The Iranian Group Theory Society (IGTS) has organized 11 national conferences during last eleven years. Moreover, three international conferences on computational algebra has been organized by the University of Kashan during the years 2014, 2015 and 2018 in which the computational group theory is one of the main topics.

The Darafsheh Prize is an Iranian prize awarded annually by IGTS to one of the best papers presented in the meetings of the society. The prize was first proposed in 2017 to be a part of the celebration of the 9th Iranian Group Theory Conference that was held at the University of Kashan, February 1-3, 2017.

**Conflicts of Interest.** The authors declare that there is no conflicts of interest regarding the publication of this article.

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Ali Reza Ashrafi  
Department of Pure Mathematics,  
Faculty of Mathematical Sciences,  
University of Kashan,  
Kashan, I. R. Iran  
E-mail: ashrafi@kashanu.ac.ir

Khadijeh Fathalikhani  
Department of Pure Mathematics,  
Faculty of Mathematical Sciences,  
University of Kashan,  
Kashan, I. R. Iran  
E-mail: fathalikhani.kh@gmail.com