

1. Introduction

The IUTAM Diversity Working Group (DWG) was established at the instigation of the August 2020 General Assembly. The Bureau was tasked with appointing a special subcommittee to address diversity issues. It was also suggested that a General Assembly meeting at ICTAM 2020+1 in Milan be held to discuss diversity matters.

The principal objectives of the IUTAM are to form a link between persons and organizations engaged in science in all branches of mechanics and related sciences. The DWG believes that this link can also be used to share initiatives and good practices in diversity that can be implemented over the forthcoming years in the IUTAM community.

Different definitions of Diversity can be considered. In particular, the Royal Society of London website defines **Diversity in Science** as: “A diverse and inclusive scientific workforce draws from the widest range of backgrounds, perspectives and experiences thereby maximizing innovation and creativity in science for the benefit of humanity”. A more general definition for Diversity given by Dictionary is: “the practice or quality of including or involving people from a range of different social and ethnic backgrounds and of different genders, sexual orientations, etc.”

2. Scope

Terms suggested by the Bureau

The following charge was set forth by the Bureau:

1. To consider ways of increasing diversity in the General Assembly (GA).
2. To consider ways of increasing diversity in the Bureau and Officers.
3. To consider ways of increasing diversity in the Congress Committee (CC). Article XIIIc of the IUTAM statutes: *‘It is desired that the composition of the CC be representative of the various mechanics disciplines, and of the diversity of the mechanics community.’*

The DWG does not wish to pre-judge whether it is necessary to increase diversity within the various committees of IUTAM, and so it first assembled relevant data on diversity.

Timeline

The DWG was stood up on February 3, 2021 and commissioned for six months. A draft report was requested to be submitted to the Bureau in early May, with the full report submitted in early June.

Data

The DWG requested historical data concerning participation in IUTAM committees. The General Secretary of IUTAM provided the Bureau membership since 1948. Aside from the results of the questionnaire administered by the DWG, all other historical data were harvested by hand from online IUTAM resources by the committee members.

Data on the statistics of the broader international mechanics community as represented by participation in recent ICTAM events were not found.

3. Overview

Our plan has been to focus on diversity mainly in terms of geography, gender, age, and mechanics disciplines. This report is based on data gathered from two different surveys: historical data on IUTAM

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bodies and data provided by the representatives of adhering/affiliated organizations of IUTAM via a questionnaire.

The first set of data has been compiled from the IUTAM web page, the IUTAM annual reports, and the open access book *IUTAM: A Short History* by Peter Eberhardt and Stephen Juhasz. In March 2021, and after the first meeting of the DWG, a survey was sent by e-mail to 72 representatives of adhering/affiliated organizations of IUTAM, and 47 responses have been received. The responses show that the level of significance for diversity varies from country to country, and organization to organization.

At first sight, the former set of data provides a fair diagnosis as to whether the IUTAM community has addressed and/or is addressing diversity matters. The responses to the first question: “Does your IUTAM-adhering body abide by a pledge or statement on diversity?” indicate that only half of the IUTAM bodies are aware or have explicitly implemented good practices pertaining to diversity (Figure 1).

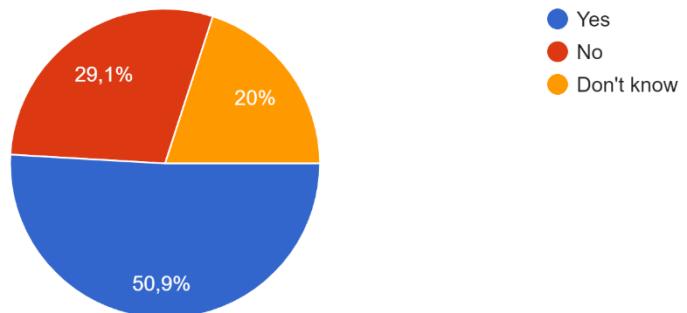


Figure 1. Responses to question 1 of the questionnaire: “Does your IUTAM-adhering body abide by a pledge or statement on diversity?”.

This observation is not fully supported by the responses to the second question: “How important are diversity considerations when selecting members of the IUTAM delegation from your nation or affiliated organization?” which indicate that the IUTAM delegates are selected accounting for diversity by almost 80% of the IUTAM bodies (Figure 2). Therefore, an examination of the successful outcomes in introducing and advancing diversity from the organizations affiliated to IUTAM may provide a basis for the implementation of diversity policies at the level of IUTAM, by sharing and developing best practices and efficient approaches.

In this regard, the questionnaire included a more specific query: “Are any of the following (age, gender, mechanics disciplines and geographical area) explicitly taken into consideration when selecting IUTAM representatives?”, see Figure 3.

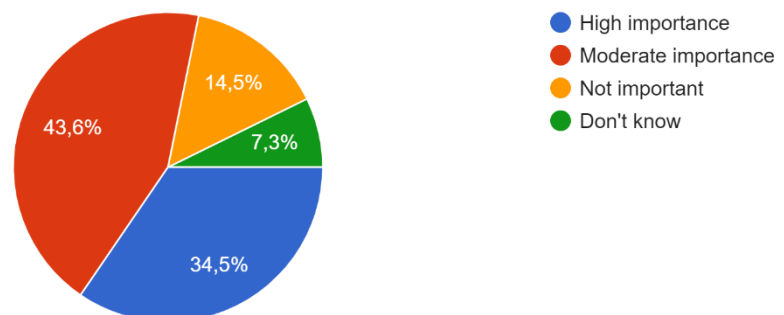


Figure 2. Responses to question 2 of the questionnaire: “How important are diversity considerations when selecting members of the IUTAM delegation from your nation or affiliated organization?”.

The responses to question 3 show that diversity in terms of mechanics disciplines has historically been addressed by IUTAM. This conclusion is also supported by the percentages shown in Table 1, which summarize the area of expertise of the members of the General Assembly (GA) during the period 2010 to 2020.

Regrettably, the data on age that we have had access to through the questionnaire are not sufficient to draw conclusions on this aspect of diversity. Figure 4 shows the responses to the fourth question: “Are demographic statistics gathered for your IUTAM-adhering or IUTAM-affiliated body?”, and more specifically,

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the 9 responses, out of 47 responses, provided when inquired about approximate breakdown by age (see Figure 5).

Table 1. Diversity of fields of Mechanics in the General Assembly (Source: IUTAM annual reports).

Year	Fluids	Solids	S/F
2020	30.4%	63.0%	6.5%
2018	29.4%	60.0%	9.4%
2016	28.4%	64.2%	7.4%
2014	29.9%	62.1%	8.0%
2012	27.8%	62.2%	10%
2010	28.0%	67.7%	4.3%

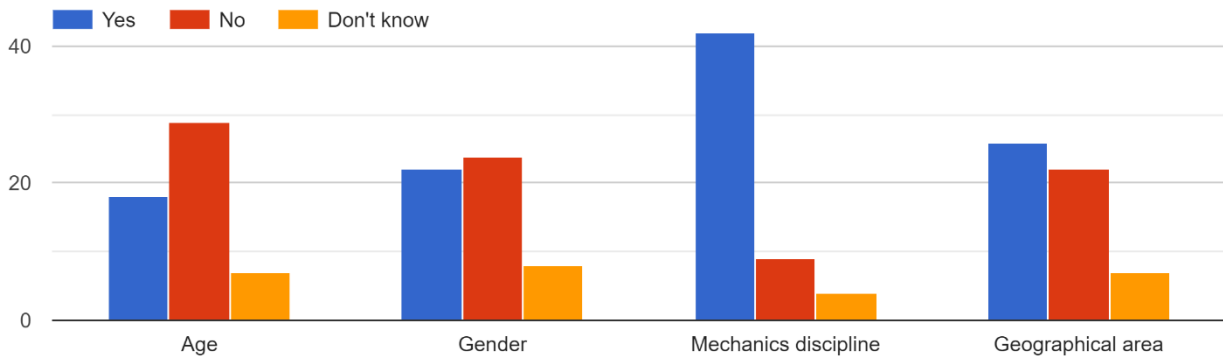


Figure 3. Responses to question 3 of the questionnaire: “Are any of the following (age, gender, mechanics disciplines and geographical area) explicitly taken into consideration when selecting IUTAM representatives?”.

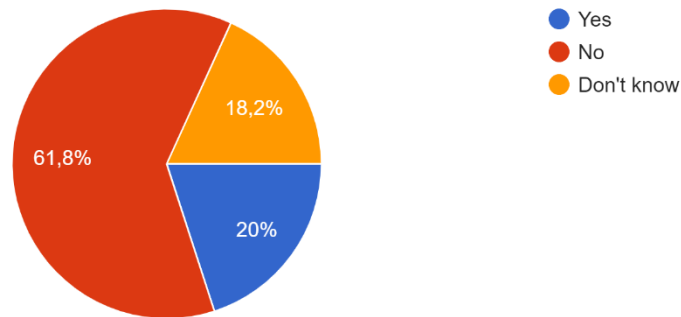


Figure 4. Responses to question 4 of the questionnaire –Are demographic statistics gathered for your IUTAM-adhering or IUTAM-affiliated body?–.

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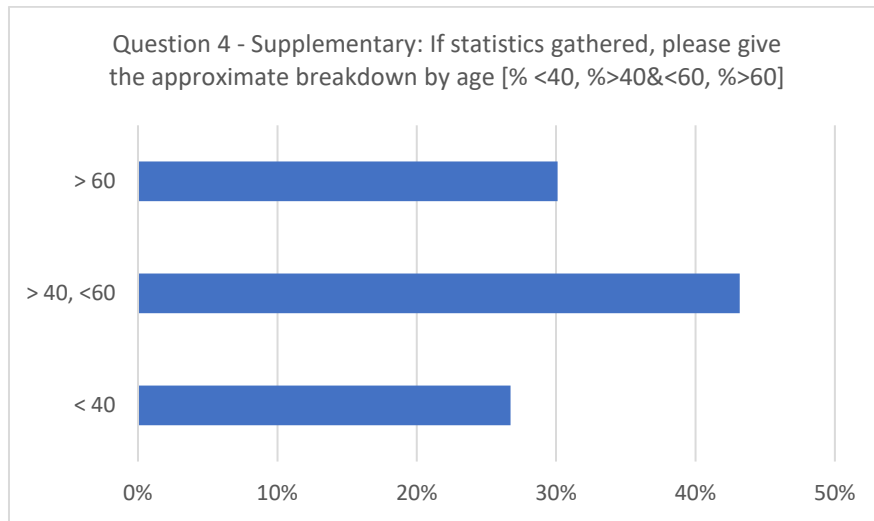


Figure 5. Responses to supplementary query provided in question 4: “Are demographic statistics gathered for your IUTAM-adhering or IUTAM-affiliated body?”. The results are based on 9 responses.

The information summarized in this section supports the following findings:

- Diversity in terms of mechanics disciplines has historically been addressed in IUTAM.
- Table 1 shows that the percentages of representatives in the General Assembly from fluids and solids are consistently 33% and 67%, respectively, during the period 2010 to 2020.
- Figure 2 shows that diversity considerations when selecting members of the IUTAM delegation are highly important for 34.5 % of the respondents, and moderately important for 43.6% of them.
- Diversity in terms of age cannot be assessed from this study due to the limited information that we have been able to gather (9 responses, see Figure 5).

In the following we analyze diversity in terms of geographic and gender balance separately.

4. Geographic balance

In this section we present and analyze data on geographical balance within IUTAM. The analysis is mostly based on historical data since most of the adhering and affiliated organizations have indicated that they do not account for this aspect of diversity when selecting their representatives to IUTAM (see Figure 3).

The information compiled from the historical data have been organized in three tables, i.e., i) countries represented in IUTAM (Table 2), ii) nationality of the officers of the Bureau (Table 3), and iii) nationality of other officers of the Bureau (Table 4).

Table 2. Country distribution within IUTAM (Source: IUTAM annual reports). NOTE: The annual subscriptions may change from year to year, but the numbers shown below for year 2020 are fairly representative.

	Asia	Europe	North America	Rest of the World
Number of countries	8 (17%)	31 (63%)	3 (6%)	7 (14%)
Number of members in the GA	19 (20%)	55 (59%)	10 (11%)	9 (10%)
Dues	34 (23%)	83 (56%)	21 (14%)	11 (7%)

Here, we have followed the common classification used in IUTAM, that establishes four geographical regions, i.e., i) **Asia**, including China, China-Hong Kong, China-Taipei, India, Japan, Korea, Singapore and Vietnam; ii) **Europe**, including Armenia, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and Ukraine; iii)

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North America, including Canada, Mexico and USA; and iv) **Rest of the World**, including Australia, Brazil, Chile, Egypt, New Zealand, Saudi Arabia and South Africa.

Table 3. Officers of the Bureau since 1948 (Source: IUTAM annual reports).

Members of the Bureau	Asia	Europe	North America	Rest of the World
President	0	15 (6 countries: Denmark (2), France (3), Germany (2), Netherlands (2), Sweden (1), UK (5))	4 (USA)	0
General Secretary	0	19 (9 countries: Austria (1), Belgium (1), Denmark (2), France (4), Germany (3), Ireland (1), Netherlands (3), Poland (2), Sweden (2))	0	0
Treasurer	0	13 (6 countries: Denmark (1), Estonia (1), Germany (4), Netherlands (4), Sweden (1), UK (2))	6 (USA)	0
Total	0	47 (9 countries: Austria (1), Belgium (1), Denmark (5), Estonia (1), France (7), Germany (9), Ireland (1), Netherlands (9), Poland (2), Sweden (4), UK (7))	10 (USA)	0

The composition of IUTAM makes sure that, from a geographical point of view, it is intrinsically diverse. IUTAM currently encompasses organizations from 49 countries, roughly distributed as shown in Table 2. Thus, it appears from the displayed numbers that the geographical representation on the administrative bodies of IUTAM follow the simple rule: Europe (50%), Asia (25%), North America and Rest of the World (25%).

Table 4. Other officers of the Bureau since 1948 (Source: IUTAM annual reports).

Members of the Bureau	Asia	Europe	North America	Rest of the World
Non-officer members	12 (3 countries: Japan (7), China (3), India (2))	56 (15 countries: Austria (3), Belgium (1), Denmark (2), Estonia (2), France (5), Germany (5), Israel (2), Italy (5), Netherlands (3), Poland (4), Russia (3), Sweden (2), Switzerland (3), UK (7), USSR (9))	6 (USA)	2 (Brazil)

Table 5. Geographical diversity in the IUTAM symposia panels since 1985 (Source: IUTAM annual reports).

Year	Asia	Europe	North America	Rest of the World
2019	-	57.1%	42.9%	-
2018	33.3%	40.0%	20.0%	6.7%
2017	-	83.3%	16.7%	-
2016	40%	50.0%	10.0%	-
2015 - 1985	19.2%	60.3%	15.9%	4.6%

The information summarized in Tables 3 to 5 supports the following findings:

- a. All General Secretaries have ever been from Europe (from 9 countries).
- b. All Bureau Officers have been connected to either European countries or the USA. Top three countries are USA (10), Netherlands (9) and Germany (9). Asia has never participated with a Bureau Officer.

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- c. For the other members of the Bureau, most entries are from Europe (56), followed by Asia (12), USA (6) and RofW (2).
- d. The only country that pays 8 annual subscriptions and has never had a Bureau member (officer or non-officer) is Canada.
- e. China currently pays 12 dues, Japan 8, Italy 8, Russia 8. These four countries have never had a Bureau Officer.
- f. China has had 3 non-officer Bureau members; Japan has had 7 and Russia (+USSR) has had 12.
- g. Austria, Ireland, and Estonia all contribute 1 annual subscription, and all have had one member in the Bureau Officers.

5. Gender balance

In this section, we address gender balance within IUTAM using the analysis of historical data and the information provided by the adhering and affiliated organizations. First, as part of question 4 in the questionnaire, 12 respondents have provided an approximate breakdown by gender for their fellows (see Figure 6). It bears mention that only 20% of the organizations participating in the questionnaire acknowledge gathering demographic statistics.

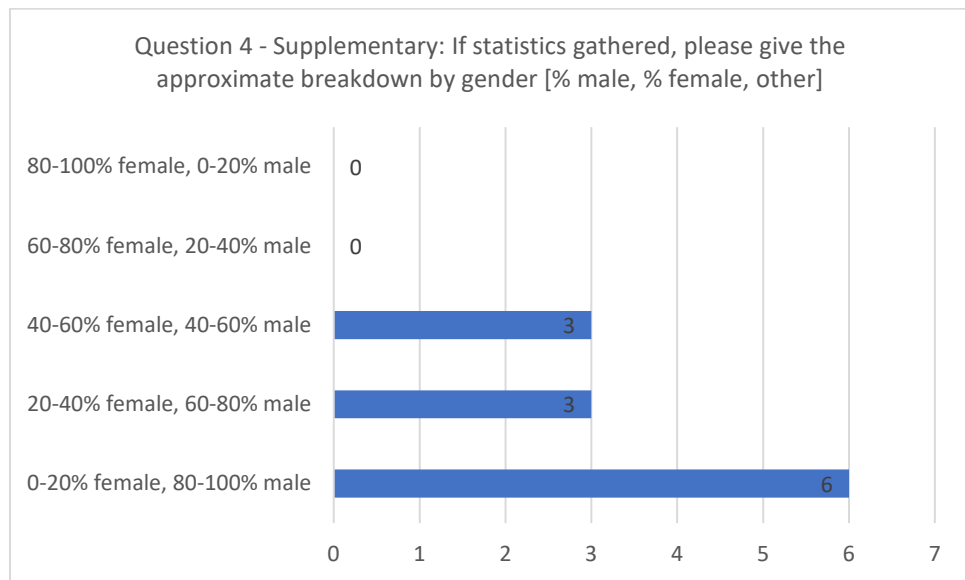


Figure 6. Responses to supplementary query provided in question 4: “Are demographic statistics gathered for your IUTAM-adhering or IUTAM-affiliated body?”. The results are based on 12 responses.

Figure 6 shows that the number of women among the total number of fellows is less than 20% for 6, less than 40% for 3, and is balanced for 3, out of the 12 organizations that have provided an input.

Next, Tables 6 and 7 gather the historical data on gender diversity in the General Assembly and Symposia Panels, respectively, over the period of 2010 to 2020. In Table 6, the data show the number of women per nation and geographical region and corresponding percentages thereof.

Table 6. Gender diversity in the General Assembly. Number of women per geographical group and total percentage (Source: IUTAM annual reports).

Year	Asia	Europe	North America	Rest of the World	Percentage
2020	1 (China)	2 (Spain, UK)	3 (USA (2), Canada (1))	2 (Brazil, New Zealand)	8.6%
2018	1	2	3	2	9.4%

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	(China)	(Spain, UK)	(USA (2), Canada (1))	(Brazil, New Zealand)	
2016	0	1 (Spain)	3 (USA (2), Canada (1))	1 (New Zealand)	6.1%
2014	0	2 (Russia, Spain)	2 USA, Canada)	0	4.5%
2012	0	1 (Russia)	2 (USA, Canada)	0	3.3%
2010	0	0	1 (Canada)	0	1.1%

Table 7. Gender diversity in the Symposia Panels. Number of women and percentage thereof (Source: IUTAM annual reports).

Year	Solids	Percentage	Fluids	Percentage
2019-2018	1 (Israel)	20%	3 (France, India, USA)	60%
2016-2017	0	0%	2 (France, India)	40%
2014-2015	0	0%	1 (India)	20%
2012-2013	0	0%	0	0%
2010-2011	0	0%	0	0%

Table 7 shows that the number of women in the congress committee has increased from 8.6% in 2004 up to 29.4% in 2020, following a clear growing trend since 2016.

Table 8. Gender diversity in past Bureau Officers and Members (Source: IUTAM annual reports).

Year	President	Vice-President	Treasurer	General Secretary	Members	Percentage
2020	0	1 (USA)	0	0	1 (Russia)	25%
2016	1 (USA)	0	0	0	1 (Russia)	25%
2012	0	0	0	0	1 (USA)	12.5%
2008 - 1948	0	0	0	0	0	0%

Table 8 shows the number of women that have held a position as Bureau Officers or Members since 1948 and corresponding percentages thereof.

Table 9. Gender diversity in the Congress Committee (Source: IUTAM annual reports).

Year	Number of women	Women (%)	Number of members
2021-2020	10	29.4%	34
2019-2018	7	21.2%	33
2017-2016	5	14.7%	34
2015-2014	2	5.8%	34
2013-2012	2	6.1%	33
2011-2010	4	11.1%	36
2009-2008	4	11.8%	34
2007-2006	3	8.6%	35
2005-2004	3	8.6%	35
2003-2002	0	0%	35
2001-2000	0	0%	35

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The information summarized in this section supports the following findings:

- a. The number of women in the GA represents 8.6% of all representatives in 2020. This percentage was 1.1 in 2010 (Table 6).
- b. Historically, the number of women that hold or have held a role in the symposia panels, both fluids and solids is 4 (Table 7).
- c. Historically, the number of women that hold or have held a role in the Bureau is 2 (Table 8).
- d. The number of women in the congress committee shows a clear increasing trend since 2016 (Table 9).

6. Other Diversity issues

As already mentioned in the introduction, **Diversity** includes many aspects beyond the four areas that we have initially identified in section 3 as key to IUTAM.

We have seeded this further analysis by compiling information from the adhering and affiliated organizations to IUTAM. To this end, we have allowed as part of question 3 for the possibility of listing any other relevant considerations included in the organization's decision process of selecting IUTAM representatives.

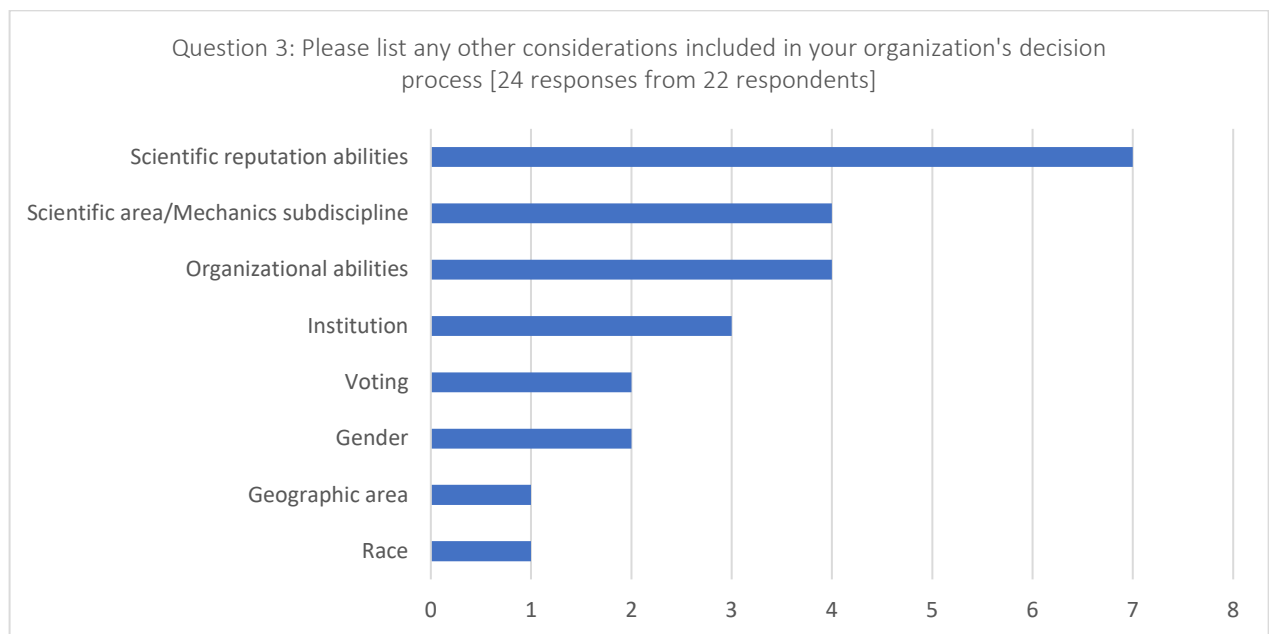


Figure 7. Responses to additional query appended to question 3: “Are any of the following (age, gender, mechanics disciplines and geographical area) explicitly taken into consideration when selecting IUTAM representatives?”.

Figure 7 shows that gender, geographic area, and race have been highlighted in 4 out of 24 responses. Moreover, we have inquired in the questionnaire about the criteria and procedures for selecting IUTAM General Assembly delegates in the adhering or affiliated organizations. The responses are shown in Figure 8, and reveal that gender, age, geography, and race are taken into account for 5, 3, 1 and 1 organizations, respectively.

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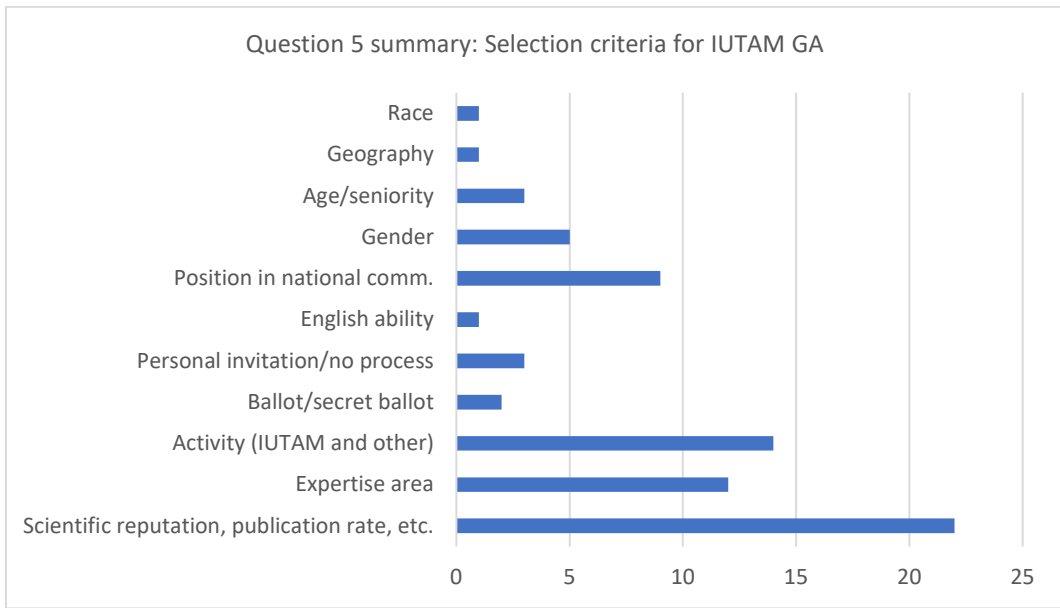


Figure 8. Responses to question 5 of the questionnaire: “What are the selection criteria and procedures for IUTAM General Assembly delegates from your nation or affiliated organization? Please give a brief summary”.

In order to identify what aspects of diversity are pertinent to the IUTAM community, the last question of the questionnaire did ask for your opinion on the matter. Figure 9 summarizes the responses.

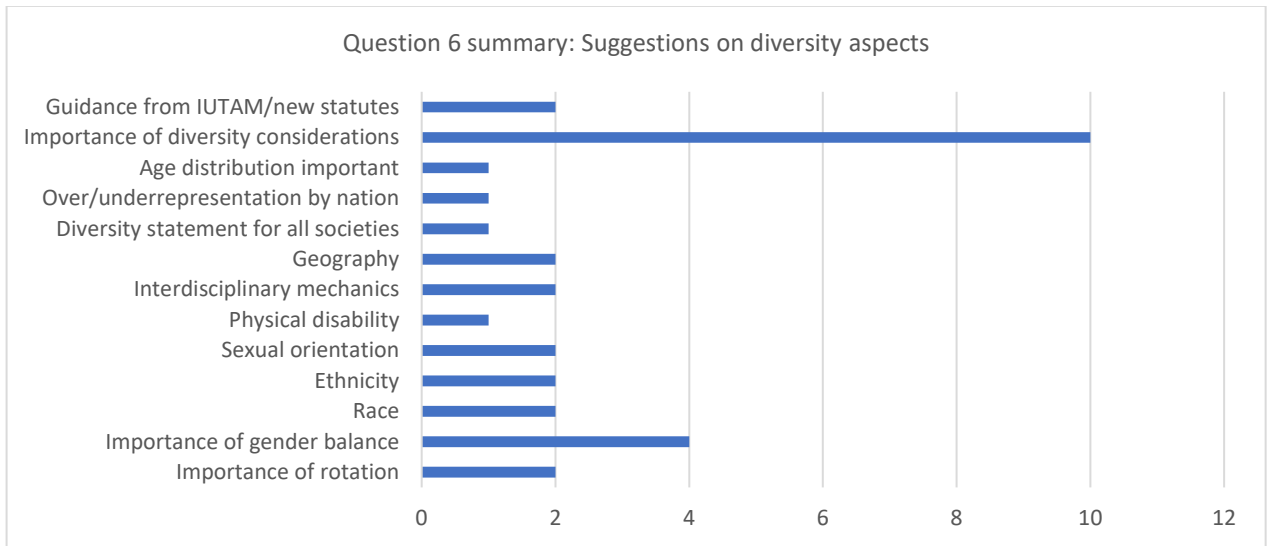


Figure 9. Responses to question 6 of the questionnaire: “Are there any issues pertaining to diversity that you wish to bring to the attention of the IUTAM Working Group on Diversity?”.

The data compiled in this section is intended for consideration as the starting point for further analysis within the IUTAM community.

Recommendations will be presented at the next General Assembly meeting (August, 2021).