Summary and follow-up of a survey on the current situation and future of analytical chemistry in Sweden

In Sweden, both the pharmaceutical industry and parts of the biotech industry have undergone recent challenging development, which has resulted in a changed labor market for analytical chemists. At the same time, the research characteristic of analytical chemistry has changed. Currently, instrument development is largely driven by instrument manufacturers, and research in analytical chemistry mainly concerns method development and applications. In order to better understand the current situation for analytical chemists in Sweden in terms of education, research and industry activities, a survey has been carried out among all active members of the Division of Analytical Chemistry of the Swedish Chemical Society. About one third of the members replied to the survey (120 out of 360). Basically, the survey aimed to answer the following questions about analytical chemists in Sweden: Who are we? What work tasks do we have? Do we need more trained analytical chemists? Do we train analytical chemists with the "right" skills for the current and future needs of industry and the community? How much and what do we teach in basic education in analytical chemistry? Are we looking for external research funds, and how do we succeed in this?

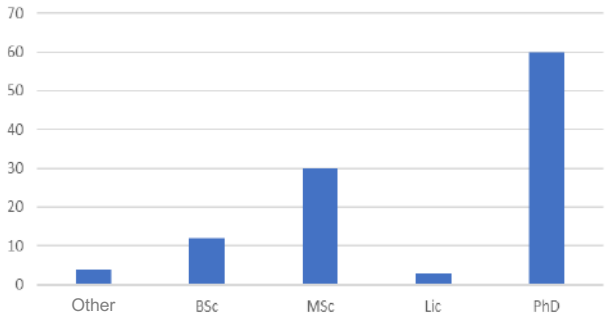
We have now summarized this survey, and we have identified the need for follow-up questions in order to be able to draw conclusions and make an action plan. Key points from the survey were presented at EuroAnalysis 2019 in Istanbul (2 Sep 2019); an extract is shown below. The complete results from the survey is available upon request.

About the survey

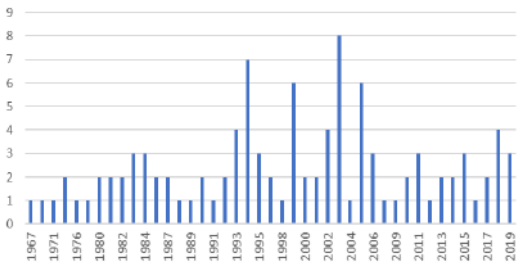
- Sent out to all members of the Analytical Division of the Swedish Chemical Society in June 2019
- 120 out of 360 answered to the survey
- Results from this survey will be summarized in a report (in Swedish) and in short texts to be published in a chemistry journal (e.g. Springer-ABC) and in a Swedish popular science journal (Svensk Kemisk Tidskrift).
- All results in the survey are anonymous

Educational background

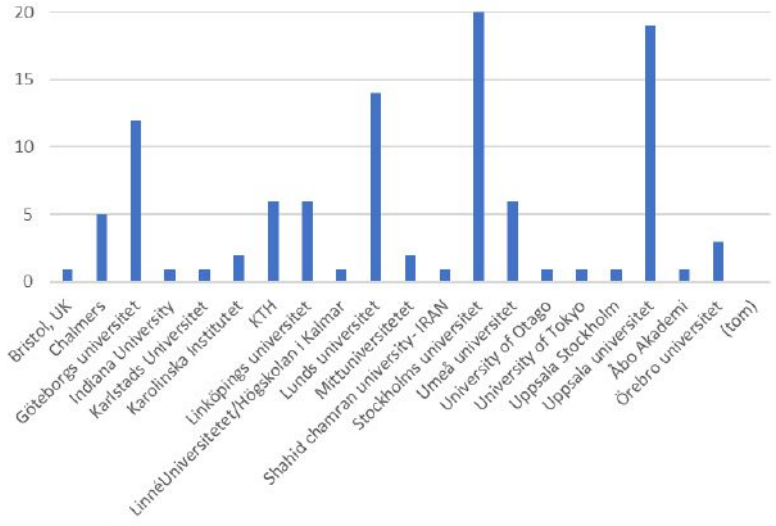
Highest academic education (single choice)



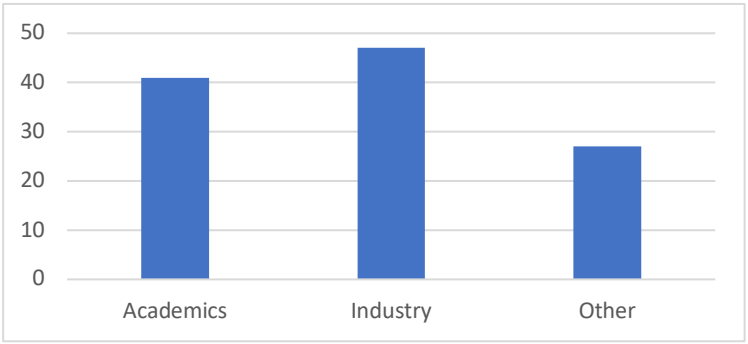
Year of exmination (single choice)



From which university do you have your degree?



Employer category



Examples of Other:
Research institute, authorities, student, retired

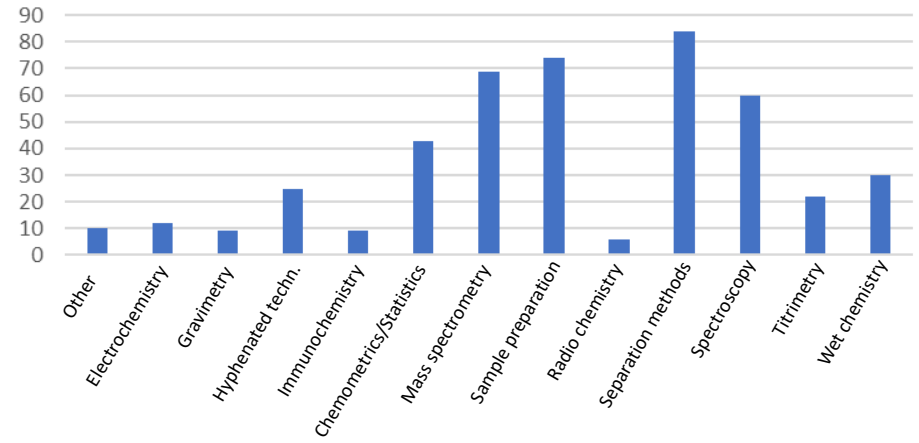
What is your position?

Examples of positions, sometimes given as associate/ senior /principle etc.

Academics	Industry	Other
Laboratory technician	Analytical chemist	Chemist
Laboratory engineer	Scientist	Hospital chemist
Health officer	Laboratory engineer	Auditor
Chemical safety advisor	Chemistry engineer	Investigator
PhD student	Specialist	Team manager
Postdoc	Research scientist	Project manager
Research scientist	Field service engineer	Research scientist
Teacher	Instrument developer	CEO
Lecturer	Sales representative	Owner
Project manager	Project manager	Retired
Associate professor	Stability manager	Student
Professor	Regulatory manager	Unemployed
Director	Team manager	
Lab director	Line manager	
Principal	Development director	
	Quality, health, safety & environment director	
	CEO	

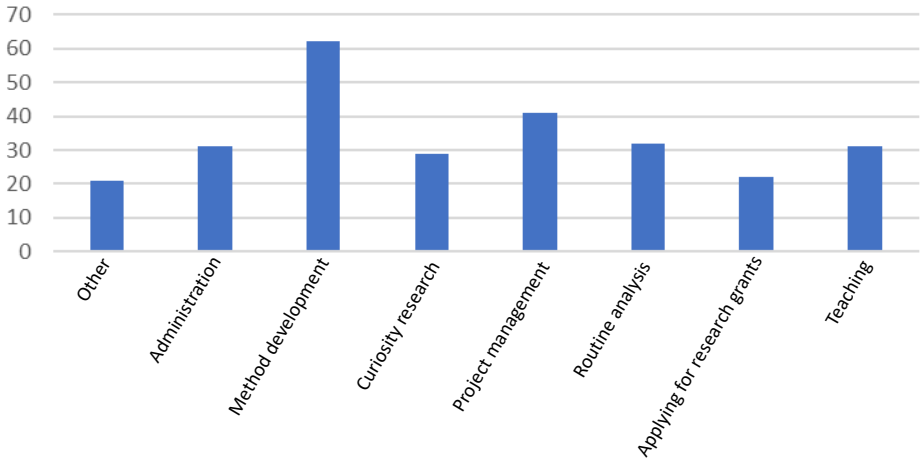
Which analytical techniques have you worked with during the last 5 years?

(multiple choice)



What are your most common tasks?

(chose max 3)



Describe in free text briefly what is included in your tasks

Examples:

”Analytical method development and validation including sample preparation of biological samples”

”Troubleshooting, method development, and quality investigations”

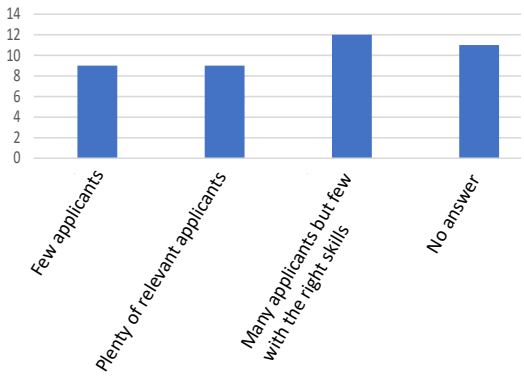
”Research, teaching, administration”

”Sales and support in Chromatography and Spectroscopy”

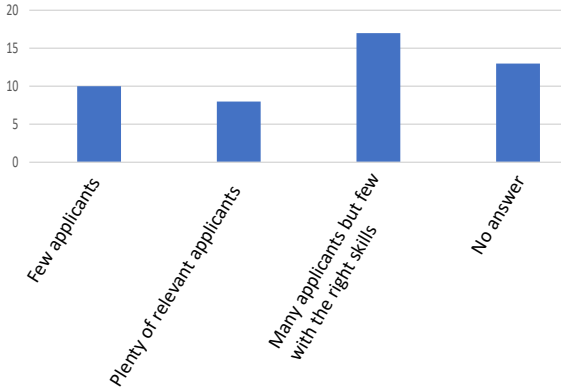
”Develop automated analysis methods for inhalers”

Do you have a picture of the recruitment situation for analytical chemists in your workplace?

Answers from Academics:



Answers from Industry:



Describe in free text briefly the recruitement situation

Examples:

”International applicants often do not have the experience of advanced equipment required”

”Recruitment of doctoral students gives many applicants (over 100) per service, but extremely few with sufficient expertise in analytical chemistry”

”In our organization, the salary situation is too low to get the right skills.”

Are you expected to have a broad technical knowledge or more focus within a specific technology?

Examples:

”To not only know the analysis technique, you also need to understand the product you are analyzing and how it is produced.”

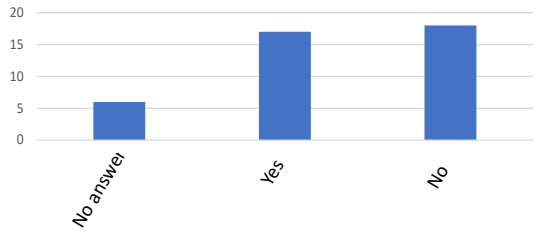
”Unfortunately, there has been more focus on technology”

”There are both generalists and specialists”

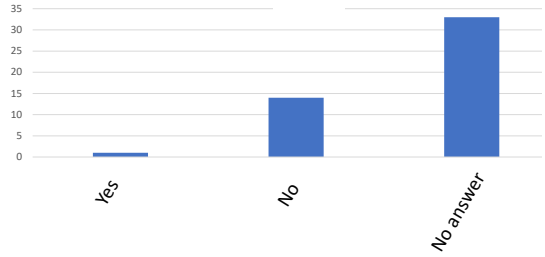
”Lab staff are expected to be able to use most of the various techniques used in routine labs. Specialists can be technology-focused.”

Are you a research leader?

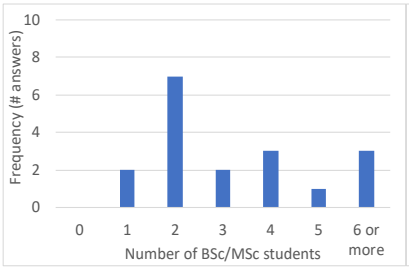
Answers from Academics:

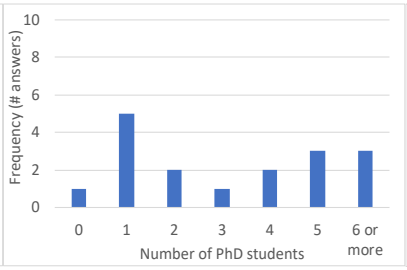


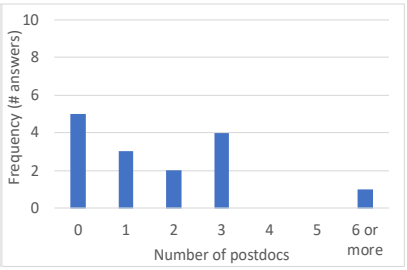
Answers from Industry:

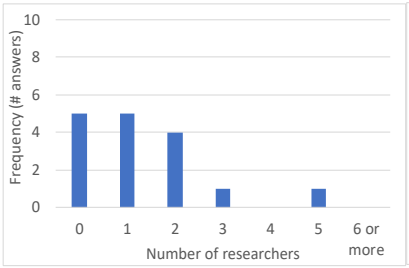


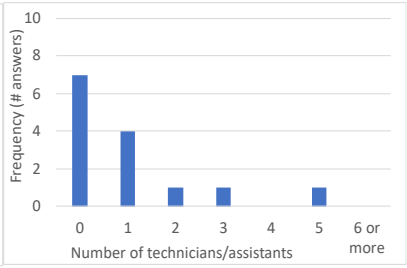
Academics: research leaders' group composition

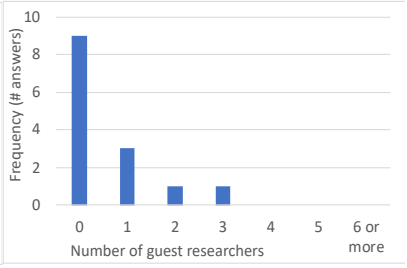




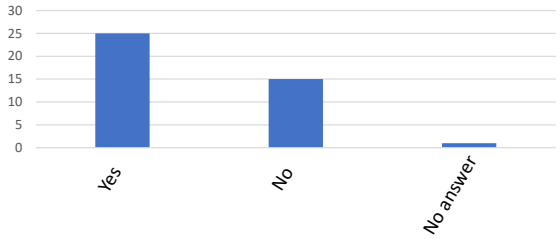




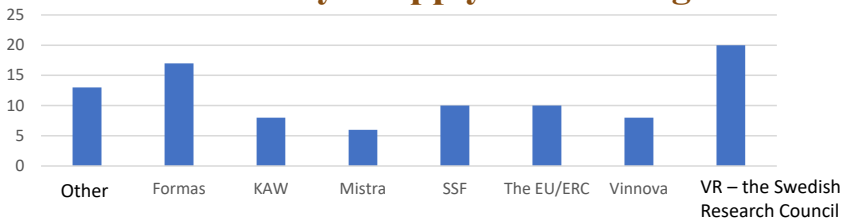




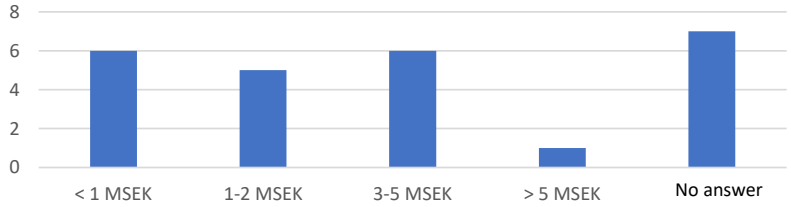
Academics: is it part of your work tasks to apply for research funding?



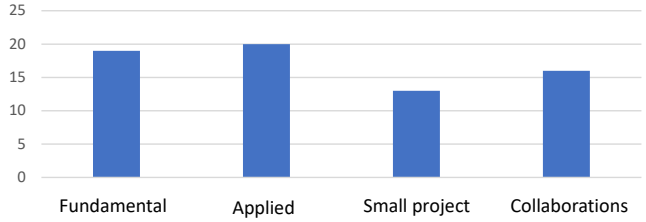
From where do you apply for funding?



If you receive research funding, what is your annual turnover? (1 MSEK is around 100 kEUR)



For what type of research do you apply for funding?



How do you experience the funding agencies attitudes to research in analytical chemistry?

Examples:

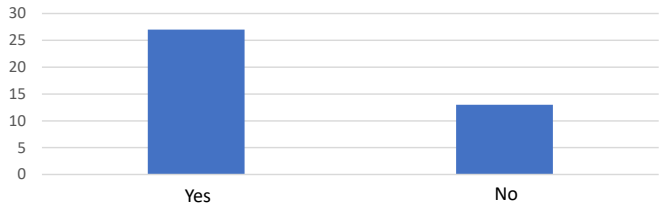
”It is far easier to obtain research funding for applied research than for basic research, and easier with collaborations than single projects.”

”They wish it to be applied, i.e. a tool is to achieve goals, the tool itself is not the goal (=hard to get funding for analytical chemistry on its own, without a directly coupled application of the technique)”

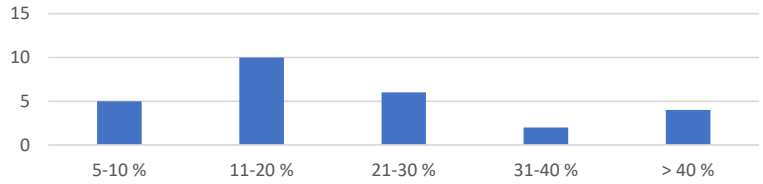
”This is problematic in some situations, not because people are against analytical chemistry, but because most panels are mixed interests and the population of the panel is based on the fraction of proposals.”

”Since we no longer get feedback from the research councils, it is impossible to know how the research is appreciated.”

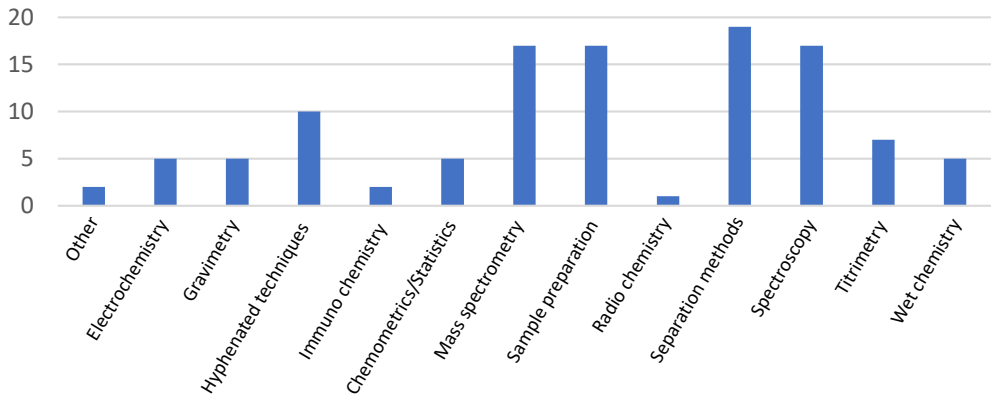
Do you teach basic education (BSc, MSc) in analytical chemistry?



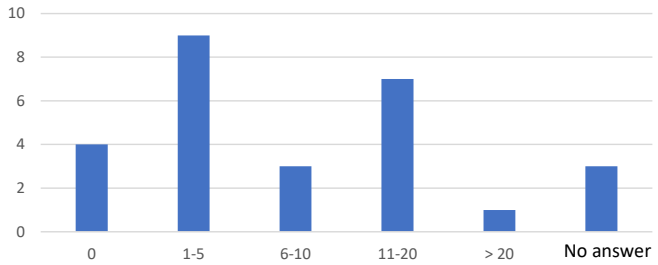
How large part of your work time is teaching?



Which analytical techniques do you teach?



How many MSc students are graduating within analytical chemistry per year at your university?



Do you also teach/supervise in PhD education?

Short summary of the survey

- Analytical chemists work with a **large variety of analytical techniques** and a **large range of different work tasks**!
- Recruitment situation in both industry and universities: **Many applicants but few with the right skills**! Only ca. 17% of the industry affiliated answered "plenty of relevant applications".
- Research groups typically: 1-5 PhD students, 0-3 postdocs, a few BSc/MSc students, rarely a technician, and **very few visiting researchers**

- Academics apply for **funding from a variety of sources**, for fundamental and applied research, and in collaborations. One aspect of this is whether analytical chemists are involved in collaborations as a support rather than having a core/leading role.
- It appears from the free text results in the survey about **funding agencies attitudes to research in analytical chemistry** that applied research in analytical chemistry easier brings in funding as compared to basic research.
- A majority of academics teach in the basic education, around **11-30% teaching duty**. Top 4 techniques taught: sample prep, separations, mass spec, spectroscopy.
- In general, **we teach the same proportions of analytical techniques as we are using them**, except for in chemometrics/statistics, where it seems like we use it more than we teach it.
- Sweden needs more **international staff** (only 6 (out of 120) with a degree from outside Sweden), and more international visitors in the research groups.

Follow-up strategic questions

- Is analytical chemistry becoming mainly a **tool** for other disciplines? What is a correct/appropriate **definition of analytical chemistry**, and its **role in collaborative projects**?
- How are funding agencies/researcher in other disciplines reasoning around **the role of analytical chemistry**, and its **future development**?
- Are we training students in the "**analytical thinking philosophy**", or do we focus too much on teaching different (old and new) technologies?
- What is the **demand in industry** in terms of skills and knowledge in newly recruited analytical chemists?
- What are the different views on the subject analytical chemistry in **an international perspective**?
- Is the **internationalization** in research groups as poor as it seems from the survey, or do we have a bias in membership in the Swedish Chemical Society?
- How do we see the **future of analytical chemistry** in ten years from now?

In order to answer the questions above, a follow-up survey is open for all members of the Analytical Chemistry Division of SCS. Please fill in this short survey as this will help us a lot to set up an efficient action plan. Hopefully, we look forward to a bright analytical chemistry future!

Thank you for your interest and engagement!

Charlotta Turner & Jonas Bergquist, on behalf of the Analytical Chemistry Division