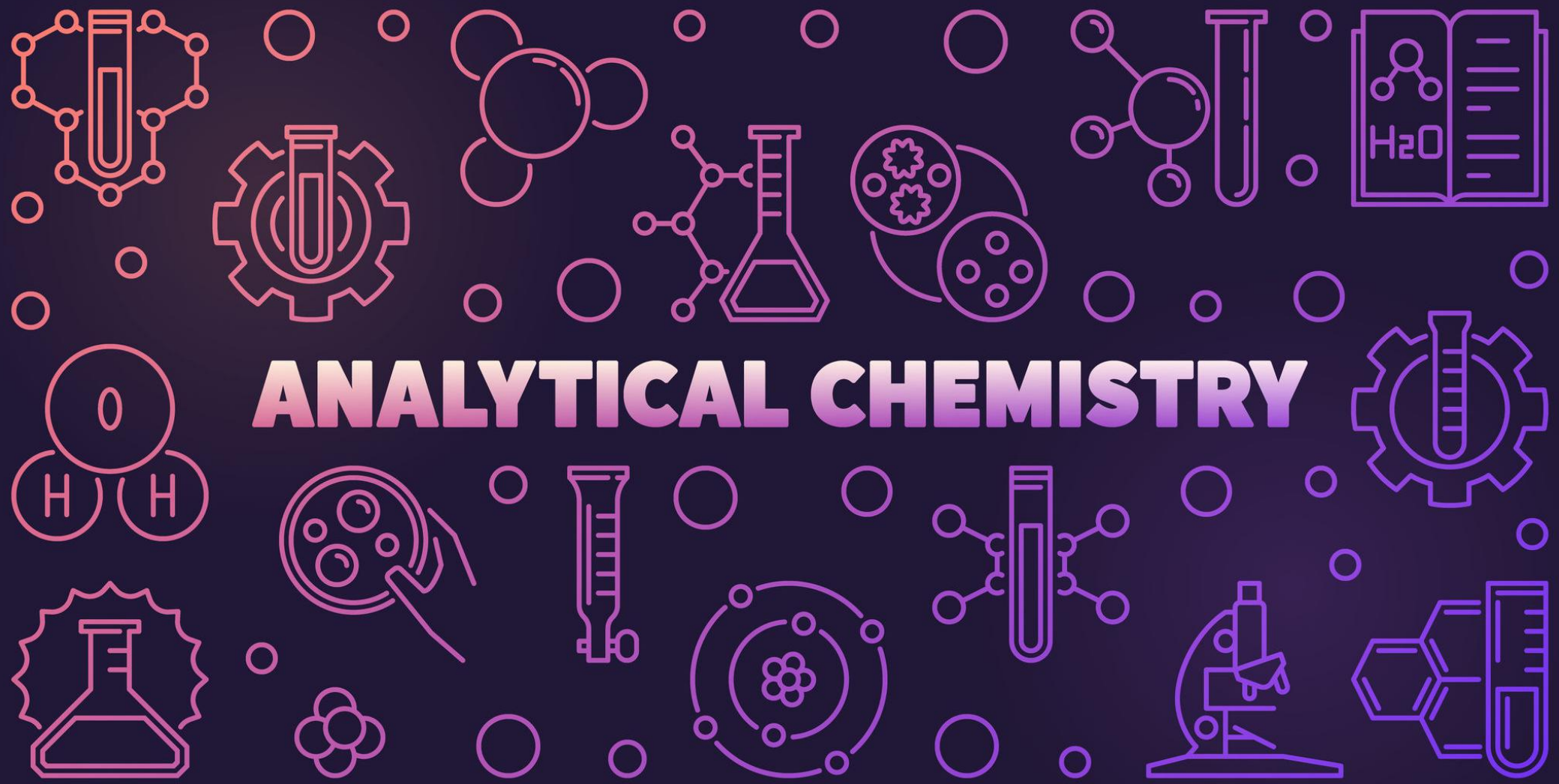
The Future of Analytical Chemistry – A Workshop, 16th of June 2020



Analytical Division, ChemSoc, Charlotta Turner & Jonas Bergquist

The Future of Analytical chemistry – Questions to discuss

- What can we do to increase our success rate at the Swedish Research Council?
- How are our proposals reviewed?
- How is other disciplines considering the discipline of analytical chemistry?
- Is there a way to “train” researchers outside our discipline?
- What can we do to enhance/improve the situation for basic research in analytical chemistry?

VR, guiding questions 2020

The scientific quality of the proposed research

- Are the scientific questions addressed important in the context of existing scientific knowledge and ongoing research worldwide?
- Does the proposal outline a research approach that permits the questions raised to be answered?
- When applicable, is the proposed development of methods or techniques of high scientific significance? Does the proposed development allow new scientific questions to be addressed?
- When applicable, how are issues relating to sex and gender perspectives justified and handled in the research plan?

In addition, for starting grant applications:

- Does the applicant show the ability to formulate a scientific question that is clearly independent of the research the applicant has performed as a doctoral student and postdoc?

VR, guiding questions 2020 (cont.)

Novelty and originality

- To what extent does the proposed project define new, interesting scientific questions?
- To what extent does the proposed project use new ways and methods to address important scientific questions?
- When applicable, does the proposed project show a clear progression in relation to the previous research of the applicant?

VR, guiding questions 2020 (cont.)

The merits of the applicant (for project grant applications)

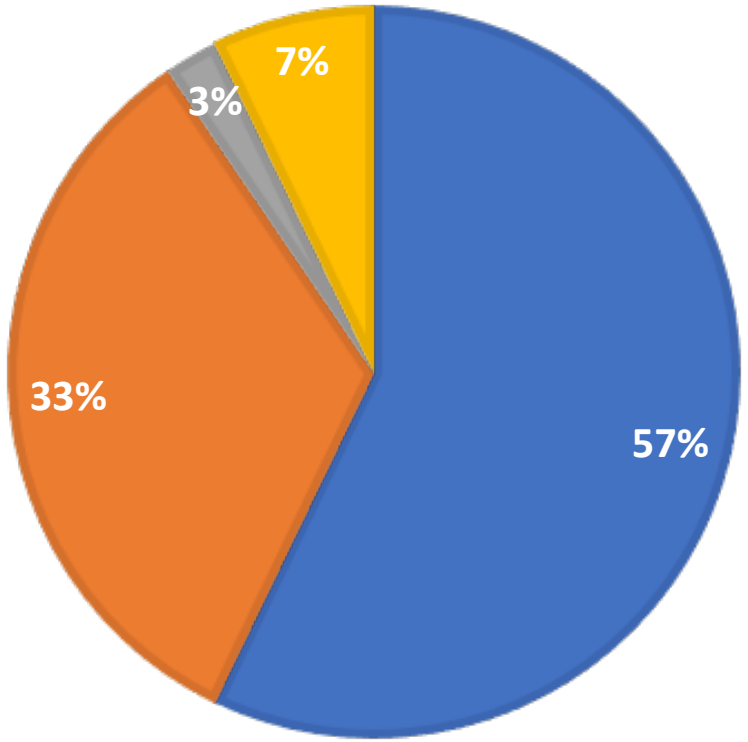
The assessment should concern the merits of the applicant to perform the proposed project. The assessment of the complementary expertise of the participating researchers is only of relevance for the grading of the feasibility of the project.

- How significant is the applicant's scientific productivity, impact and other merits in a national and international perspective, in relation to the research area? Here, the emphasis should be on recent (the last 8 years) scientific achievements.
- What is the applicant's scientific competence within the research area of the application?
- When applicable, does the applicant have previous experience in the development of experimental or theoretical methods?

"HOW WOULD YOU DEFINE ANALYTICAL CHEMISTRY?

- Fundamental and practical applications of how to measure important chemical things, which include concentrations, rate constants, lifetimes, and whatever - as long as what is measured is a chemically important parameter [R.W. Murray, Anal. Chem., 2007, 79
- Analytical chemistry deals with the identification of compounds and mixtures (qualitative analysis) or the determination of the proportions of the constituents (quantitative analysis) [Webster's New World College Dictionary, 2010]
- Analytical chemistry is what analytical chemists do [C.N. Reilly, 1965]
- Other

From our follow-up survey to analytical chemists (Analytical Division)



Other suggestions of definitions (from our own division, the survey):

- Analytical chemistry is more than measuring things. Analytical chemistry deals with the qualitative analysis of chemical parameters (what could be called Lavoisier's perspective), but also how these parameters relate to larger scientific questions about chemistry.
- The development of techniques and methods for qualitative and quantitative determination of compounds in sample matrices, as well as studies of the physical and chemical interactions that enable separation and detection
- Design and development of new tools and their application to study important chemistry and chemical parameters and correct and quantitative measurements of the same

Survey to analytical chemists, university employed

How do you view the role of analytical chemist in society?

Forgotten
An analytical scientist is more concerned about the quality of the measurements
Its really important because when you visit industry, medical inst, material sciences, agriculture, environment you find a lot of errors in analysis are done because people without knowledge are doing analysis
very important
As a discipline that supplies chemical knowledge that is skeptical and scientific. I relates such important knowledge as dosage and sensitivity matters, and further a critical view on what can be measured and not.
Contributes with knowledge and support for accurate measurements, enhances the competence of instrument operators performing chemical measurements, and improves/invents new analytical methods and techniques.
Very important of course. "Everything" needs to be analyzed.
An important chemistry discipline, which gives a holistic view of different challenges in the society, from the importance of proper design and data points, to the ability to draw certain conclusions depending on how analysis was done. More and more challenges requiring complex chemical analysis demands a continuous development of the field, in addition to being an important support ("tool") for other disciplines.
Contributes with knowledge and support for accurate measurements, enhances the competence of instrument operators performing chemical measurements, and improves/invents new analytical methods and techniques.
Important in many fields
It would seem that most analytical chemistry is applied, e.g. in quality control or diagnosis.
Essential in all fields dealing with manufacturing, research and health
Analytical chemists develop new methods addressing problems, the solution of which requires new analytical methods (including all the required steps from experimental planning and sampling to the reporting of the results and the uncertainties in the results)
It is a fild of high impact for society and also towards a sustainable developent of the society.

Survey to analytical chemists, industry/research institutes

How do you view the role of analytical chemist in society?

To develop technologies and methods for chemical measurements, work to provide data from chemical measurements, share knowlede of analytical chemistry
most activties in natural science rely on analytical chemistry
Essential for many industrial processes, personal care and health.
Important
Important, measuring e.g. enviromental pollutants but also presenting the results in a format suitable for the receivers. Important!
Possibly a bit marginalized by staying in the background too much
Someone who work to provide chemical data, by developing and performing analytical testing, or in other ways support or lead activities related to chemical measurements, and can explain and assess how chemical measurements are performed and their underlying principles.
As a garantee of quality of results and research
Important for everyday life
Analytical chemist's are essential for estabilish safe products with testning of products.
Part of the science machinery

Survey to analytical chemists, all included

How do you think others (from other disciplines) view your role as analytical chemist?

Wondering what an analytical chemist is needed for
Where I work, there are challenges in positioning analytical chemistry as an own dicipline. Things have got better during recent years, some of the problems are related to the background of the dept, i.e. Pharmaceutical Dev.
Very different depend on institution or industry. But unfortunately, it is not uncommon that it is too conected with "doggy work".
underestimates the importance - until our roads are crossed. Once starting to discuss, they are commonly very greatful for support as they realize we can help avoiding misinterpretations. The trick is not to get data, it is to get relevant and reliabel data!
This question is imposible to answer in an good way. Depends on the disciplines, education, industry or academia, people who are not chemist.
they do not know what it is
the merely think of me as an chemist, who solves chemical problems with chemical analysis
Sorry but low status
Sometimes as a service provider only using knowledge they developed, but not creating any new insights. But that more reflects us accepting such a role, rather than highlighting that new scientific insights require new reliable new data, often generated by chemical analysis combined with statistical methods.
Someone who provide analytical data and develop test methods.
Part of the science machinery
Others are more interested in the measurement and not aware of the quality; they think that analytical chemist make things to complicated

Survey to analytical chemists, all included

How do you think others (from other disciplines) view your role as analytical chemist?

Often only as a service.
Obscure if you ask the general public. In a hospital setting (where I work) the genberal gist of what we do is fairly well known, and the importance acknowledged
Not highly appreciated, but good they are available, but slow in their work
Most (good) chemists know "how to measure important chemical things". Hence, the role of the analytical chemist is unclear and poorly defined. and is seen as obsolete my many chemists from other disciplines
Knowledgeable support -but sometimes as a lesser service
Knowledgeable support -but sometimes as a lesser service
It´s varying. Some mean that everyone can use chemical analysis when needed.
interesting
Important support
important
I've heard too many times that "You only did the analyses". It's totally diosrespectful and shows an ingorance of the importance of high quality analyses.
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I have heard that other chemist view analytical chemistry less seriously compared to e.g. organic chemistry: "just insert your sample and push the button".

Survey to analytical chemists, all included

How do you think others (from other disciplines) view your role as analytical chemist?

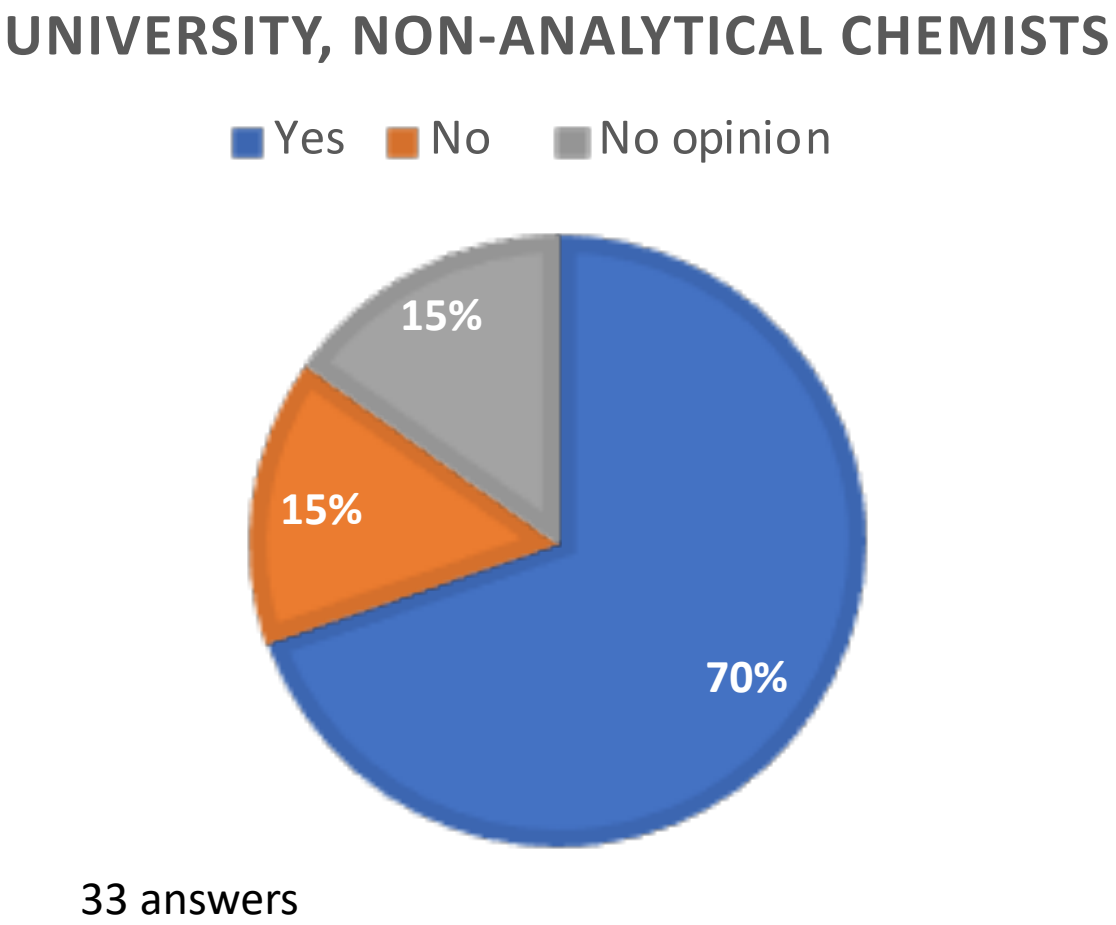
Exchangable
Development of methods and doing chemical analysis.
At best as a helpful, and supporting, science. Not as a stand-alone discipline.
as unnecessary
As something simple
As someone doing chemical analysis employing already developed (and evaluated) methods
As important in order to solve their problems
As a technical operator that supports other disciplines.
As a technical operator that supports other disciplines.
As a supporting discipline
As a support function
As a service person.
According to them we are just a help to get more reliable results
A specialist of high value.

How is other disciplines considering the discipline of analytical chemistry?

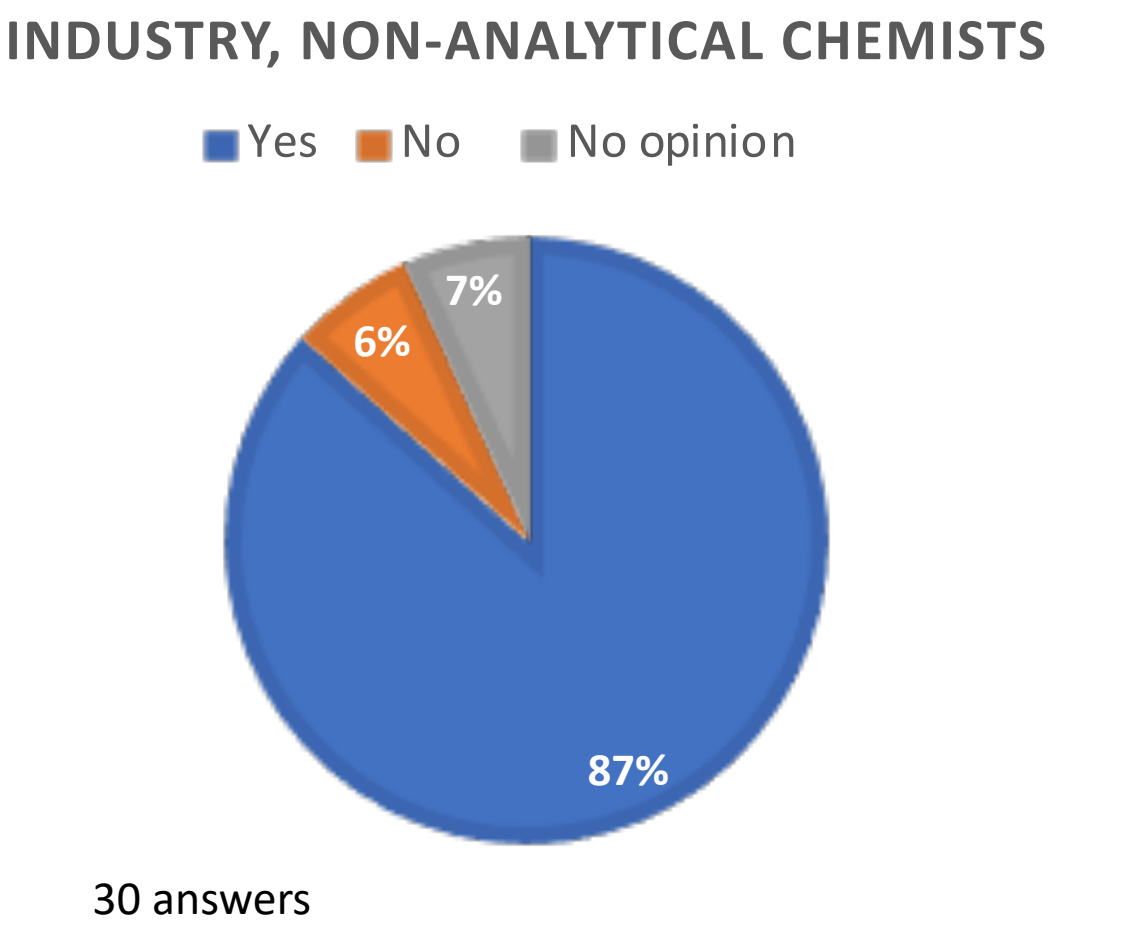
- Survey sent to all other divisions (not Analytical Chemistry Division) of the Swedish Chemical Society
- Total number of answers: 121
- 29 of the persons answered that they “identify themselves as an analytical chemist”. These are sorted out in most figures below (when indicated “non-analytical chemists”

Survey to non-analytical chemists, academics

Do you think analytical chemistry is one of the few core topics in chemistry?



33 answers



30 answers

Survey to non-analytical chemists

What role does analytical chemistry play in research collaborations?
(rank 1 to 5, where 1 is most important and 5 is less important)

Role of analytical chemistry in a research collaboration	University	Industry	Total including all	Ranking
Ensures that a lot of articles are published in the project	2,0	2,2	2,6	1
Contributes with a holistic view of the entire research project	2,0	2,7	2,9	2
Contributes with statistical/chemometrics knowledge	2,7	3,5	3,5	3
Contributes with analysis data to joint publications/reports	3,4	3,8	3,9	4
Contribute with analytical expertise in different ways	3,5	3,8	4	5
Develop analytical methods that can be used in a project	3,5	4,2	4,1	6
Perform chemical analysis	3,7	3,9	4,1	7
	n=30	n=30	n=121	

Some of the answers might be a misunderstanding of the scoring system 1–5

Retired, unemployed, research institute, other + answers from analytical chemists that for some reason answered to this survey

Survey to non-analytical chemists, university employed

How would you define analytical chemistry as a topic?

Using chemistry for quantitative analysis
The exploration, validation, and refinement of analytical methods aiming to detect, quantify, and speciate different chemical substances, compounds, and interactions
the development of tools for analyzing molecules, materials & complex mixtures
The description, innovation and development of tools for investigation and analysis of various chemicals and elements, based on a deep understanding of the behavior of the compounds under investigation.
The basis for synthesis and for environmental chemistry
The art of defining the purity and concentration of substances.
Spårhunden som hjälper mig förstå vad som händer i mina processer
separation, quantification, characterisation and identification of substances
separation, identifikation och kvantifiering
Precise with errors
one expert area of several, e.g. organic, inorganic, theoretical, physical, etc. A discipline aiming at analysis of known and unknown materials qualitatively and quantitatively under quality standards.
Looking for special subjects

Survey to non-analytical chemists, university employed

How would you define analytical chemistry as a topic?

Läran om kvalitativ och kvantitativ bestämning av kemiska komponenter samt utvecklingen därav.
It's the science of identifying, extracting and quantifying molecular compunds whatever the context
It is a branch of physical chemistry with an emphasis on quantification
In principal it is maybe no it is more applied in other topics of chemistry. Many of us use analytical chemistry as well although we are not experts. The discipline ned to develop though and then the experts in the field need to do that together
Identification and quantification of molecules in various samples
How to quantitatively and qualitatively measure molecules
For purification identification of important molecules
Finding content of complex mixtures to be able to stift them
empirical analysis
bending into the core experimental disciplines
Any way of getting grades out of matter
According to the table of contents of Skoog
A division of physical chemistry

Survey to non-analytical chemists, university employed

How do you view the role of analytical chemists in the scoiety?

To interact with the other chemistry specialities.
To advance our technical, societal, and health development
There is a fundamental need for the constant development of techniques for more accurate characterisations, from more difficult environments and from smaller amounts of materia.
The possibility to detect small quantities environmental and medicinal chemistry research
the general public doesn't know about how complex chemical analysis is.
That's a silly question, it depends on what the analytical chemist is DOING.
Tests on different products and samples to ensure health or standard
Repetitive
Picky
not different fom the scocietal role of any other "kind" of chemist
No opinion
Less known

Survey to non-analytical chemists, university employed

How do you view the role of analytical chemists in the scoiety?

It is often very important to be able make careful chemical analyses of various (molecular) compounds, e.g. in the environment
Important... easy to connect with society needs.
Important! It develops measurement techniques.
Important to ensure quality of products
important since it gives theoretical chemists experimental data
Important for biotechnology and chemistry industry
Important
exakthet
Ett oundgängligt hjälpverktyg vid utvärderingen av processers prestanda
Creating tools for efficient analysis of environmental samples, tracing leaks, surveying drug metabolization or mapping distributions of compounds for instance, is extremely important for all parts of society.
Använder analytisk kemi som ett verktyg för bestämning av kemiska komponenter och studerar trender i struktur/egenskaper.
absolutely essential. you know, air, water, soil, health & forensics...

Conclusions

- We need to discuss the future of analytical chemistry
- We need to discuss/agree on an appropriate definition and content (what analytical chemists actually do)
- We need to communicate this to other disciplines
- We should also keep on pushing this at VR and FORMAS, and not give up