



ISAR News

Newsletter of the International Society for Antiviral Research

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Special issue on the European Training Network ANTIVIRALS ETN

IN THIS ISSUE

ISAR President's message (Johan Neyts)
ANTIVIRALS ETN's coordinator's message

(Frank van Kuppeveld)

European Training Network ANTIVIRALS
(Angelica Corcuera, Haridian Montañez Brull,
Roberto Manganaro)

The ANTIVIRALS consortium (Angelica
Corcuera, Roberto Manganaro)

A personal story of an ANTIVIRALS recruit
(Haridian Montañez Brull, Le Thi Tuyet Nhung)

Getting ready for the future. (Marion Francisco &
Angelica Corcuera)

Networking in the ANTIVIRALS ETN (Birgit
Zonsics)

ISAR President's message (Johan Neyts)

A special issue should be special.... this is indeed what this issue is. Under the editorial control of ANTIVIRALS, this issue of ISAR News is written by a group of Ph.D. students who attended ICAR and whose doctoral studies are being funded by the Marie Skłodowska Curie European Training Network "ANTIVIRALS". The aim of this funding initiative of the EU is to train a new generation of creative, entrepreneurial and innovative early-stage researchers (ESRs) who are able to convert knowledge and ideas into products and services for economic and social benefit. The ANTIVIRALS consortium is coordinated by Prof. Frank Van Kuppeveld (University of Utrecht) with the assistance of Dr. Clasiën Oomen. At the most recent ICAR in Porto, the consortium held a satellite workshop introduced by the coordinator. Two of the Ph.D. students (early stage researchers, ESRs) gave short oral presentations during this workshop and the others, 90-second shotgun talks to attract attention to

their presentations (poster or oral) later during the conference.

A very important mission of ISAR is to bring young scientists to ICAR. This will help to make sure that the next generation of scientists active in the field of antiviral research is being trained. A number of fellows of the ANTIVIRALS consortium were selected for oral presentations at the conference; others received poster awards. This all reflects the quality of their work and thus also of their training.

At the request of ISAR, ANTIVIRALS submitted a contribution, written by ESR Anna Plaszczyca, to issue 28.1 of the ISAR News. As you may have read in that issue, young scientists do also see the possibilities that a high level conference such as ICAR offers in terms of networking. Anna gave an interesting account of the many positive experiences of herself and her fellow ESRs.

Frank gave a short introduction to the ANTIVIRALS consortium at ICAR, but many ISAR members may remain unaware of the consortium and its work. This special issue, largely written by ESRs, gives a fuller picture and also describes their experiences during their three year training.

To finish, I would like to remind you that ISAR has a brand new website (www.isar-icar.com). I invite all of you to subscribe via the website to the ISAR mailing. Since networking is important and we should reach out to those that do not yet know about ISAR/ICAR; I invite all of you (if you did not do yet) to become a follower of our LinkedIn and Facebook page as well as of our Twitter account (all accessible via the website). Please recommend these sites also to others.

I hope you will enjoy reading this special issue,

Johan Neyts, President ISAR.

ANTIVIRALS ETN'S coordinator's message (Frank van Kuppeveld)



This special issue of ISAR News tells about the Marie Skłodowska Curie European Training Network ANTIVIRALS-ETN. Being the coordinator of this training network, I am very honoured to welcome you to this issue, which has been composed entirely by the Early Stage Researchers of the ANTIVIRALS network. This ISAR News issue will discuss this network and what it has achieved so far.

You may have caught a glance of the network at the ICAR held in Porto in June 2018, where the consortium organised a satellite symposium about the network and its achievements. In addition, all 15 Ph.D. students trained in this network presented their research in oral or poster presentations. One first and four second prizes were awarded to young researchers from the network.

I am very proud of the progress and scientific advances made by the 15 Early Stage Researchers of ANTIVIRALS since the start of the network in March 2015. Most of the young researchers are expected to finish their research project in the coming months, after an intense training period of three years. Intense it has been, these young researchers have not only received training on conducting research and scientific matters but have also acquired many transferable skills. One of these skills is conveying a scientific message to a lay audience, which the researchers have done enthusiastically by participation in open door days of universities, in teaching programmes for high school children, and in writing blogs and articles for non-scientists etc. Importantly, all researchers have been exposed to research environments in both academic and industrial settings, and have learned a lot more about Intellectual Property Rights, business plans, unique selling points, (time) management and team skills than a standard Ph.D. student.

I am grateful to the European Commission, who has funded this interdisciplinary and intersectoral training network. This grant not only facilitated the training of 15 young researchers, but also created intense collaborations between ANTIVIRALS'

academic and industrial research groups that will last beyond the project period. Also, I am grateful to ISAR for giving the ANTIVIRALS network the opportunity to engage with so many excellent researchers worldwide, both during the ICAR and in this Newsletter.

Please feel free to contact us at ANTIVIRALS-ETN@uu.nl or check our website www.antivirals-etn.eu

European Training Network ANTIVIRALS (Angelica Corcuera, Haridian Montañez Brull, Roberto Manganaro)

The EU-funded ANTIVIRALS Innovative Training Network (ITN) is the successor initiative of the successful EU-funded EUVIRNA ITN. The ANTIVIRALS ITN started in 2015 to train the next generation of specialists in antiviral drug development. Nowadays, there is a need for more broadly qualified scientists equipped to take antiviral drug development forward with a broad know-how in molecular virology, biochemistry, structural biology, computer-aided drug design and medicinal chemistry.

Viral infections are a major cause of disease, with enormous costs in morbidity/mortality and socio-economic losses worldwide. Since only a few viral diseases can currently be prevented by vaccination, antiviral therapy is an essential instrument to control these infections. At present, however, specific and licensed antiviral drugs have been developed only against HIV, hepatitis B virus, influenza virus, hepatitis C virus, herpesviruses and some other viruses. Thus, there is a clear and unmet need for antiviral drugs to prevent, treat, or eliminate infections with other important human pathogens (e.g. enteroviruses, coronaviruses, dengue virus, chikungunya virus, respiratory syncytial virus, etc.). This great need for future experts in the field trained in a multidisciplinary and intersectoral setting, with a focus on both basic and applied aspects of antiviral drug development, was the driving force of this network.

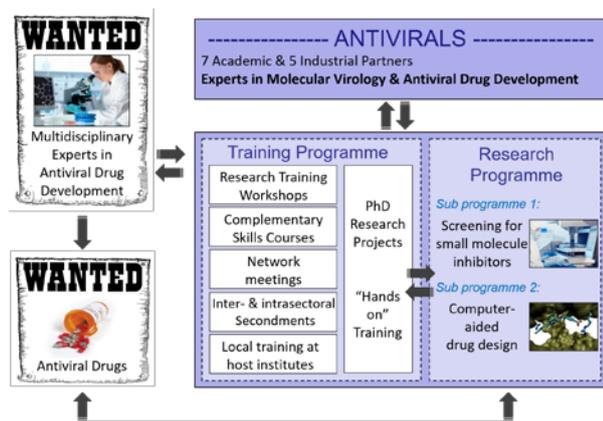
To fill this gap, seven European research institutes and five industrial partners have established the ANTIVIRALS consortium, offering a multidisciplinary and intersectoral Research Training Programme to 15 talented Early Stage Researchers (ESRs), preparing them for a leading role in antiviral drug discovery in European industry or academia.

Aim of the H2020 Marie Skłodowska-Curie actions
The Marie Skłodowska-Curie actions (MSCA), part of the EU-funded H2020 programme, provide grants for all stages of researchers' careers—be they

doctoral candidates or highly experienced researchers—and encourage transnational, intersectoral and interdisciplinary mobility. The MSCA enable research-focused organisations (universities, research centres, and companies) to host talented foreign researchers and to create strategic partnerships with leading institutions worldwide.

The MSCA aim to equip researchers with the necessary skills and international experience for a successful career, either in the public or the private sector. The programme responds to the challenges sometimes faced by researchers, offering them attractive working conditions and the opportunity to move between academic and other settings.

The MSCA are open to all domains of research and innovation, from fundamental research to market take-up and innovation services. Research and innovation fields are chosen freely by the applicants (individuals or organisations) in a fully 'bottom-up' manner.



Research networks support for Innovative Training Networks (ITN):

ITNs support competitively selected joint research training and/or doctoral programmes, implemented by European partnerships of universities, research institutions, and non-academic organisations.

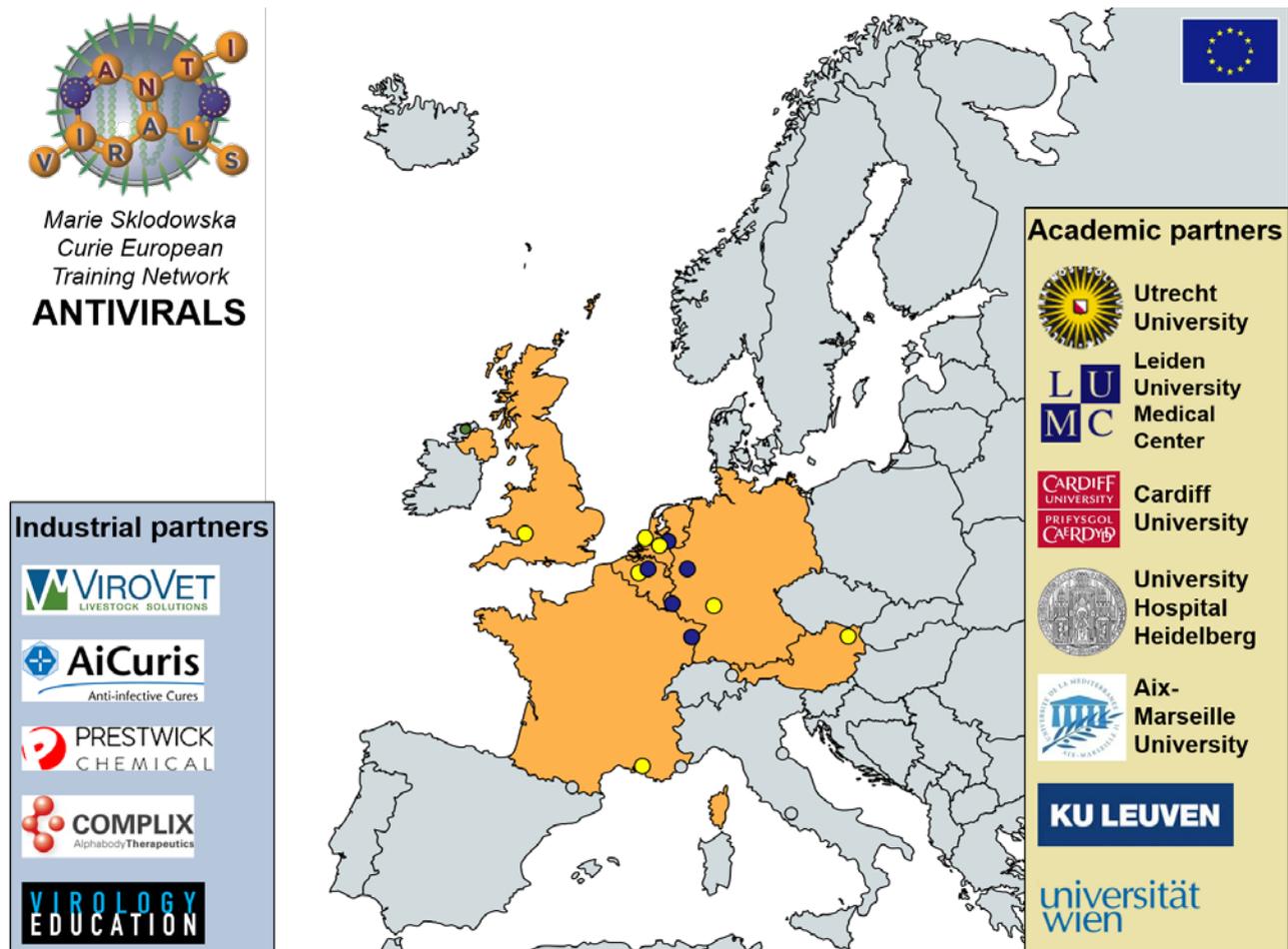
The research training programmes provide experience outside academia, allowing participants to develop innovation and employability skills.

Next to the interdisciplinary European Training Networks (ETN), ITNs include Industrial Doctorates (EID), in which non-academic organisations have an equal role to universities in respect of the researcher's time and supervision, and joint doctoral degrees delivered by several universities (EJD programme). Furthermore, non-European organisations can participate as additional partners in ITNs, enabling doctoral-level candidates to gain experience outside Europe.

The ANTIVIRALS Consortium (Angelica Corcuera, Roberto Manganaro)

The intersectoral ANTIVIRALS training network includes seven outstanding European academic partners and five European industrial partners or partner organisations, located in seven different countries. Three academic partners specialise in different scientific and technological areas of molecular virology with an interest in antiviral drug development and resistance. The group of Prof. Dr. Frank van Kuppeveld in Utrecht University works on elucidating the structure, entry, replication and molecular pathogenesis of picornaviruses. In Leiden University Medical Center, the team of Prof. Dr. Eric Snijder focuses on the replication, virus-host cell interactions, and evolution of positive-sense RNA viruses, such as coronaviruses, while the team of Dr. Martijn van Hemert has a special interest in the molecular biology of Chikungunya and Zika viruses, both of which caused recent outbreaks around the world. The group of Prof. Dr. Ralf Bartenschlager at the University Hospital of Heidelberg studies the replication, virus-host cell interactions, pathogenesis, and the innate immune responses induced by infections of persistent viruses, such as hepatitis C and B viruses, and acute lytic arboviruses, such as dengue and West Nile viruses. The other four academic partners specialise in the identification and development of novel antiviral compounds and strategies. The groups of Prof. Andrea Brancale in Cardiff University and of Prof. Thierry Langer at the University of Vienna specialise in molecular modelling and computer-aided drug design and development, while the group of Prof. Bruno Canard and Dr. Bruno Coutard at the Aix-Marseille University focuses on the *in vitro* aspect of drug development. The team at the Aix-Marseille University focuses on characterisation of viral enzymes and proteins involved in replication and transcription of RNA viruses, in particular concerning enzymological mechanisms and structural biology. Subsequently, they use this information in the development of target-based screening assays. The team at the Catholic University Leuven is known for its antiviral cell-based screens and focuses on the development of antiviral strategies against a range of RNA viruses, such as enteroviruses and arboviruses, and also has expertise in the development of small animal models for flaviviruses, such as Zika virus.

To complete the network, the participation by the five industrial partners ensured that the 15 recruits had a chance to experience antiviral research and development in the private sector as well as in academia. AiCuris Anti-infective Cures GmbH (Dr. Holger Zimmerman and Dr. Alexander Birkmann) is a pharmaceutical R&D company specialised in antiviral drug discovery and development.



Prestwick Chemical (Dr. Christophe Morice and Dr. Marie Louise Jung) is a contract research organization specialised in medicinal chemistry. Complix NV (Dr. Ignace Lasters and Dr. Sabrina Deroo) is a small-to-medium sized enterprise (SME), which pioneers an exciting novel class of biopharmaceuticals called Alphabodies. ViroVet NV (Dr. Robert Vrancken) is an SME that develops antiviral drugs for use in animals. Virology Education (Prof. Dr. Charles Boucher) is an SME specialised in training and education. In addition to their scientific know-how, these industrial partners shared their unique expertise in areas like innovation, entrepreneurship, management, and marketing to the training program by allowing the students to perform short secondments in these companies.

Ultimately, all partners are recognised leaders in their field of expertise, and their overall expertise and skills are highly complementary. This ensures the students receive diverse and comprehensive state-of-the-art training.

A personal story of an ANTIVIRALS recruit

(Haridian Montañez Brull, Le Thi Tuyet Nhung)

Kristina Kovacicova, a young scientist from Slovakia who decided to become citizen of the world a while ago, obtained her Honour's degree in Biomedical Science from the University of Edinburgh in 2015. Afterwards, she was a research assistant at the Agency for Science, Technology and Research of the Singapore Immunology Network. Currently, she is working at Leiden University Medical Center (The Netherlands) in her ANTIVIRALS project entitled "Development and mode of action of chikungunya virus inhibitors", a project which already shows encouraging results.

How does the experience in the ANTIVIRALS network affect you?

Participating in the ANTIVIRALS ETN has been a very rewarding professional experience. I broadened my knowledge in research fields related to my own – molecular virology – and developed soft skills through various tailor-made courses relevant to both research and non-research careers. As a result of these training opportunities, I feel better prepared for today's competitive job market.



Which were your initial goals? Have you managed to achieve them? My initial goals were to enhance my skills in experimental design and project management as well as in delivering effective presentations. Through my independent lab-based Ph.D. research project and skills training organized within the ANTIVIRALS network, I have been able to improve all of them: I can reliably plan, execute and analyse experiments, and have become a more confident presenter.

What did you like most about this experience?

What I enjoyed the most were the ANTIVIRALS meetings; both for its programme content and the social part. It has been great to hear and share my Ph.D. experience with other international students based at different European universities or biotech companies. I greatly appreciate the professional network that I have been part of as an ANTIVIRALS ESR and I hope I will be able to maintain and benefit from these connections in the future.

Getting ready for the future.

(a personal experience by **Marion Francisco & Angelica Corcuera**)

The aim of the ANTIVIRALS network was to “prepare 15 talented Early Stage Researchers for a leading role in antiviral drug discovery in European industry or academia”. But what the next career step looks like after the ANTIVIRALS training network for an individual depends not only on the training, but also on the personality and goals of the particular trainee. ANTIVIRALS participants Marion Francisco and Angelica Corcuera describe what gave them insight in their career goals and opportunities:

“As the end of the ANTIVIRALS training network approached, we had a short workshop on careers in research in our last network meeting in Leiden, Netherlands to help us prepare and plan for what comes next. The first half of the workshop was focused on looking inward. In order to have an idea

of our dream job, the workshop moderator asked us things like “What is it that you want to do? What things are important for you to find or have in your next job? What are deal breakers?” At the same time, he made us look at the reality of things to see if these were feasible, and what could we do to maybe make the unrealistic a little more realistic.

After thinking and getting to know ourselves a bit better, for the second half, we had an opportunity to see what is actually available in terms of careers. We had something like a speed-dating session where we were able to talk to people from different career paths, including former EUVIRNA ESRs. One EUVIRNA ESR remained in academia and is doing his postdoctoral research at a university. Another is now an associate editor for a publishing house. The third went on to study epidemiology and is now working in the field for the European Centre for Disease Control and as a World Health Organization consultant. Aside from EUVIRNA ESR alumni, we also had a chance to talk to a female group leader at a research institute, a scientist in a diagnostic lab, a postdoctoral researcher at a governmental institute, a project manager, and a European patent attorney.

These discussions have helped us get a better idea on what we want to do next after the ANTIVIRALS training network. We believe that the training we received from the network, both in research and soft skills has helped us get one step closer to our career aspirations.”

Networking in the ANTIVIRALS-ETN (Birgit Zonsics)

Many young researchers find the term networking a little intimidating. Most find it unnatural and consider networking a necessary evil to obtain valuable contacts for the future. To me “networking” sounds a little bit like a cold-hearted calculation, which is actually the enemy of any networking effort. But the ANTIVIRALS network is very different. It started as collaboration between long-standing research collaborators and friends in the field of antiviral research.

What was considered “networking” in the ANTIVIRALS consortium?

Academic research groups with great expertise in antiviral development joined forces in this consortium with established industrial research groups and start-ups with an outstanding track record in marketing antiviral drugs or technologies,. After obtaining funding from the European Union, the consortium set out to find the students that would be trained at a high level in the field of antiviral research and who would deliver their research in the

form of a Ph.D. project over the course of three to four years.

Clasien Oomen, the project manager of ANTIVIRALS recognised the benefits of a retreat-like setting for the first encounter of all participants. During the following days the newly composed network started to glue. Our personality types were analysed to understand who might be working well with whom. We were assigned our own mentor according to the desired career path. We should grow together over the course of the training programme to become the next generation of antiviral researchers, collaborators and friends. Several networking activities and games were prepared; we got to know each other quite well, so that in the future collaborations, common projects, secondments and group-assignments were easy to organise. The expected outcome was a homogenous and well-connected group, but the ESRs even met in private to visit each other in their cities, or hometowns, curious to make most out of their new contacts. This has certainly surprised our supervisors and exceeded their expectations of a functional training network for ESRs.

So what are the benefits of such a network for the participating organisation and for society?

Knowledge transfer and the possibility to get first-hand information from some of the best people in the field is one of the key advantages the network. In this way, the participants are on the forefront of new discoveries and get and share information about their project quickly and informally while others have to wait until the research is published. They can see more pieces of the antiviral research puzzle earlier.

Another potential benefit of a good network is to enhance the productivity and create more research outcomes over a wider range of fields and topics. This leads to more open science in the greater community. And when it comes to antiviral drug discovery, it should be considered a responsibility for society and the next generations to present solutions that can protect or cure us from these devastating diseases. A task that on the long run is likely to be achieved more efficiently in a collaborative effort.

And what are the benefits for the individuals?

When it comes to the benefits to the networking individuals, it might help to make contacts to get the next job or to enhance one's reputation. Although a LinkedIn profile alone is far from granting immediate career success, keeping in touch with people and being informed about their work status, the country they live in now or their current and former employers might help to get a step closer to your own goals. Another advice in this context is to think: "What could I offer?" and, with this question

in mind, approach conversations and new people. This helps to actively listen to new contacts and might just open up an opportunity where you could offer yourself a job by discovering and filling the needs of some of your old or new friends.

Having a network of colleagues, who keep up-to-date with your research, might also help to create visibility for issues you want to tackle as a researcher and it raises awareness for new innovations or ideas.

Last but not least, people who can communicate well are often liked by others. They are appealing employees, as they likely work well together with their future co-workers in a professional way. So, no matter if someone is introvert or extrovert, if a group of people has recognised the potential of a person and can certify about it, references for a new job are easy to obtain. Someone will likely champion, promote their friends a little if they are convinced about their capabilities and have experienced a good interaction while working with them. Also here LinkedIn helps their users as it is easier to obtain recommendations or endorsements for your skills.



Can you give concrete examples of the outcomes directly related to successful networking within the ANTIVIRALS-ETN?

Yes, I would like to close with some specific examples of how I experienced networking in ANTIVIRALS. From the beginning of the project we knew which colleagues worked on the same virus. This led to synergies. During my secondment, I went to Marseille for one month to the structural biology group and we tried to obtain a crystal structure of the protein I was working on together with an active inhibitor identified in cell-based assays in Leuven. There, I learned how to follow established protocols for protein expression and purification and I was also able to generate some data from binding assays that will be used in my

Ph.D. thesis and a research paper. The work was very different from the work at Cardiff University, my home institution, where I work in medicinal chemistry and computer modelling.

During my stay I got welcomed and I was integrated very nicely into the existing group, I had the possibility to talk to students as well as to group leaders in the institute and I got a very good insight into how things work in a different group, a different country, and within a different discipline. Although it was just a short stay, it was a priceless experience that has personally and scientifically enriched me.

A new project that was initiated by a group of students within the ANTIVIRALS network might just be the best example of the sprouting network of our supervisors. The idea came from a crucial publication and some previous work and existing knowledge at Utrecht University. Lisa Bauer, a virologist, approached the computational and medicinal chemists from Cardiff and Vienna, to help her develop and execute a project targeting a non-structural protein of enteroviruses of which the crystal structure had become available. Together, we gathered ideas on how to best target the protein and how to distribute the work amongst us. Quickly, this project developed into the flagship project of the ANTIVIRALS network. It is a proof of concept that having colleagues sharing common goals creates great opportunities. More and more people got involved and the powerful network of our supervisors definitely proved its value as we had all the necessary facilities and technologies at hand to optimise the outcome. In the process, the personal bond between the students and towards the project also strengthened, and the sense of having achieved something together gives us all a feeling of greater satisfaction.

All ESRs presented their research projects in plenary talks or posters at the most recent ICAR. Many non-participating researchers approached members of the ANTIVIRALS network to learn more about its structure and its projects. This created a big boost in visibility for the participants of ANTIVIRALS and has definitely added value and reputation to each of us as Ph.D. students.

Networking is for me mostly about being curious and truly interested, helping each other and making new friends. Together, we can achieve much more and go much further than as separated individuals.

Antiviral research is of global importance; by teaming up we can tackle emerging issues in a more efficient way.

ISAR News is an official publication of the International Society for Antiviral Research that is posted on the ISAR website (<http://www.isar-icar.com>).

This special issue of ISAR News was prepared by Early Stage Researchers of the ANTIVIRALS European Training Network (Roberto Manganaro, Angelica Corcuera, Haridian Montañez Brull, Marion Francisco, Nhung The Tuyet Le and Birgit Zonsics)



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