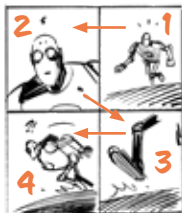


This manga is published  
in the Japanese reading direction,  
from right to left,  
including the reading bubbles.



So here,  
you are at the end.





**Sébastien Tessier signs his comic books under the pseudonym DAMOUR**, his mother's maiden name. Born in La Roche-sur-Yon in 1972, a passionate amateur of drawing, he came to study plastic arts in 1990 in Bordeaux where he still resides. He decided to live from his passion for comics and met Delcourt Editions at the Angoulême fair in 1994. This was the beginning of a long collaboration with the scriptwriter Jean-Pierre Pécau on the series *Nash* and *Le Testament du Docteur M.* He has produced 28 albums to date, with various scriptwriters and illustrators, including the series *Pinkerton*, *La Cagoule*, *un Fascisme à la Française* at Glénat, as well as two historical albums, *Kennedy* with Sylvain Runberg as scriptwriter and *L'Étincelle de Saint-Sardos*, of which he is the author, at Sud-Ouest editions. He is passionate about history and has been working on historical projects for several years.

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**Kankr, whose real name is Simon Baert**, is an author. He is the scriptwriter of the duo Plop & Kankr, formed with the cartoonist Julie Besombes, alias Plop. Together, they regularly publish in regional, national, and international press (*Le Monde*, *Siné Mensuel*, *Le Temps*, *Sud Ouest dimanche*, *Le Sans-culotte B5*, *L'Anjou Laïque*, *La Galipote*, *La Gazette du Béarn des gaves...*) and on television (*Une semaine dans le monde* on France 24). They are members of the Cartooning for Peace and Cartoon Movement networks. He also scripts scientific popular comics for the University of Pau and the Pays de l'Adour within the framework of the Science with, and for Society label.

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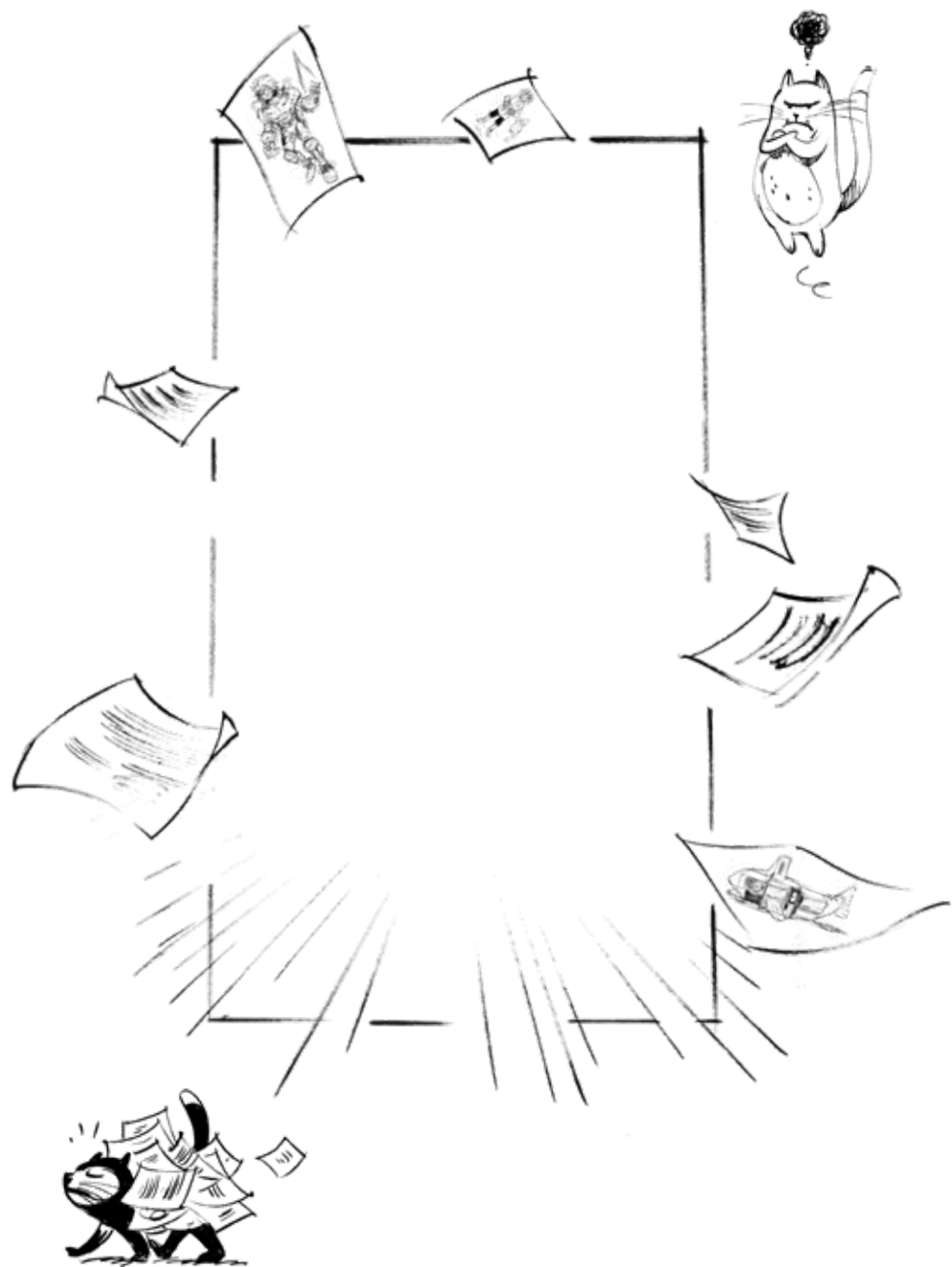


**Plop, whose real name is Julie Besombes**, is a press cartoonist, illustrator and graphic designer. Together with Kankr, she forms the duo Plop & Kankr, who publish in the regional, national and international press (*Le Monde*, *Siné Mensuel*, *Le Temps*, *Sud Ouest dimanche*, *Le Sans-culotte B5*, *L'Anjou*, *Laïque*, *La Galipote*...) and for television (*Une semaine dans le monde* on France 24). She also produces press cartoons and popular science cartoons for the University of Pau and the Pays de l'Adour as part of the Science with and for Society label Science avec et pour la société.

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**Thomas Ferreira** is editor and graphic designer at Presses universitaires de Pau et des pays de l'Adour (PUPPA). In particular, he helped to create the comic strip magazine *Ebullition(s)*, for which he is artistic director. He is also an illustrator and graphic designer under the name Atelier Decaté.





# 10 years,

already 10 years since the idea of replacing oxygen with oxygen was born between the partners from the Universities of Oviedo, Pau and the Adour Region, and TotalEnergies...

Initially, it took some convincing to obtain initial funding and to complete the proof of concept that led to the patent.<sup>1</sup> Then, through the study of combustion mechanisms, it became clear that this instrument had so many exciting possibilities: a novel and single detection approach that enables sensitive, accurate and compound-independent quantification of the carbon, hydrogen (and therefore the C/H ratio!), sulphur<sup>2</sup>, nitrogen<sup>3</sup>, and finally oxygen<sup>4</sup> contained in the target molecules.

Over the last four years, with the patent licensed to Shimadzu, development has accelerated, and we are now able to present the ELEM-SPOT instrument, which will revolutionize elemental detection in gas chromatography.

.....

#### 1 - Method for detecting and quantifying oxygen in oxidizable compounds

2016-12-14 (PCT/EP2016/080892) - WO2017/114654 - 2015-12-29 EP 15382670.6, 29th december 2015  
Total Raffinage Chimie, FR / Universidad de Oviedo, ES / Université de Pau et des Pays de l'Adour, FR / CNRS, FR  
GIUSTI Pierre FR / RUIZ ENCINAR Jorge ES / MOLDOVAN Mariella ES / BOUYSSIÈRE Brice FR

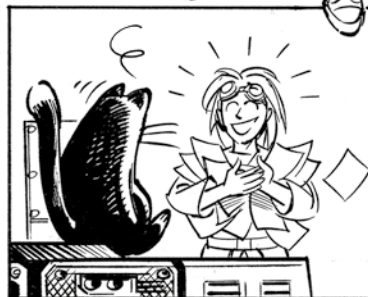
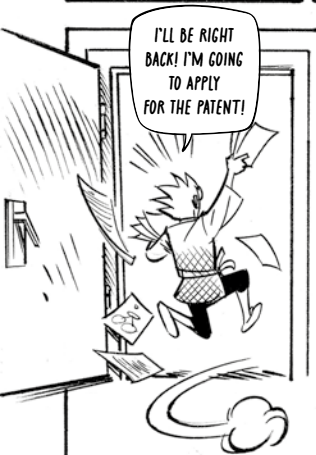
2 - Quantitative multiplexed elemental (C, H, N and S) detection in complex mixtures using gas chromatography, Freije-Carrelo L., García-Bellido J., Alonso Sobrado L., Moldovan M., Bouyssièrre B., Giusti P., Ruiz Encinar J., Chemical Communications, 2020, 56 (19), pp. 2905-2908. DOI: 10.1039/c9cc09842a.

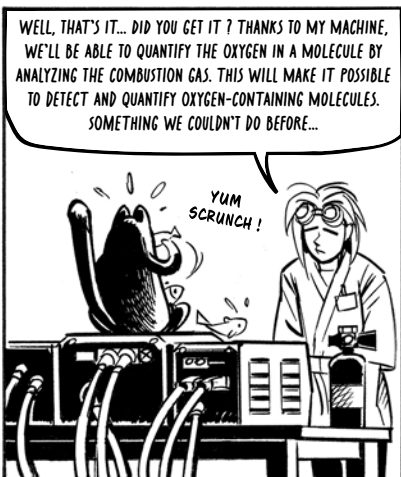
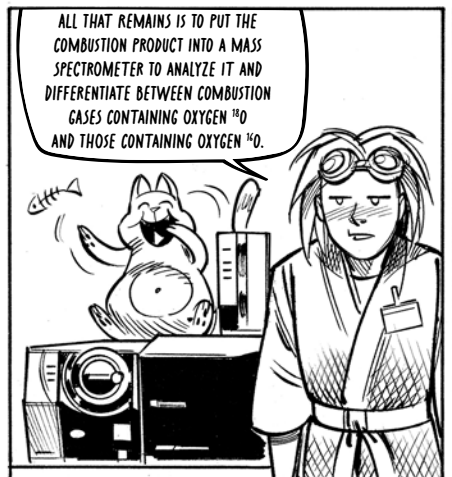
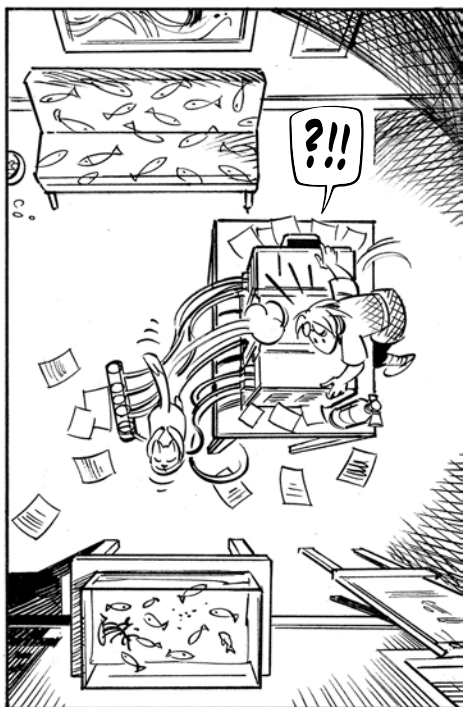
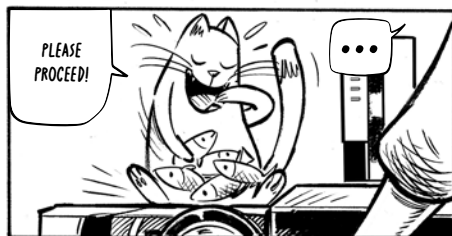
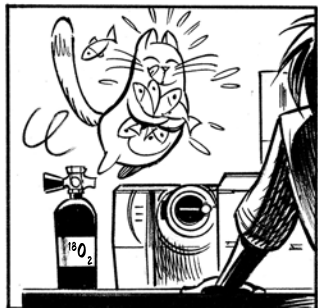
#### 3 - Potential of GC-Combustion-MS as a Powerful and Versatile Nitrogen-Selective Detector in Gas Chromatography,

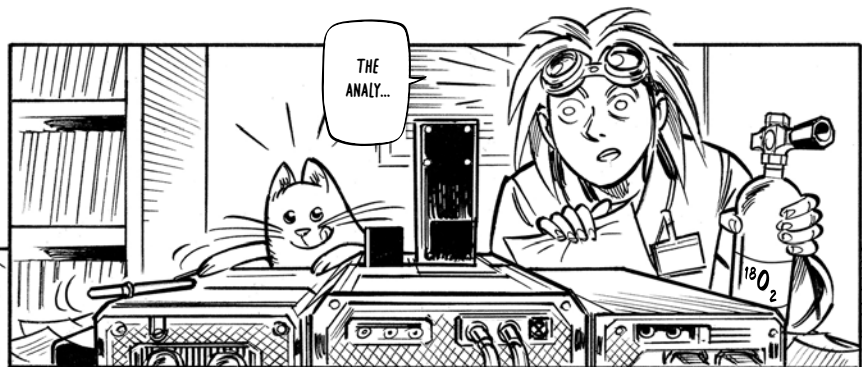
García-Bellido J., Freije Carrelo L., Redondo-Velasco M., Piparo M., Zoccali M., Mondello L., Moldovan M., Bouyssièrre B., Giusti P., Ruiz Encinar J., Analytical Chemistry, 2023, 95 (31) pp 11761-11768 DOI: 10.1021/acs.analchem.3c01943.

#### 4 - Sensitive detection and quantification of Oxygenated Compounds in complex samples using GC-combustion-MS

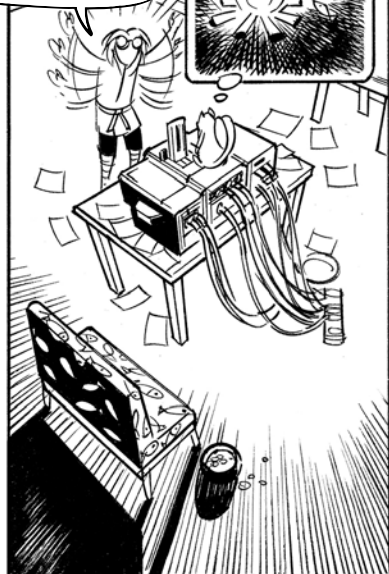
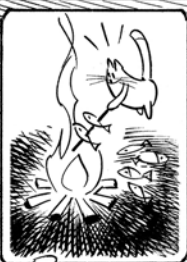
García-Bellido J., Redondo-Velasco M., Freije-Carrelo L., Moldovan M., Bouyssièrre B., Giusti P., Ruiz Encinar J., Submitted.







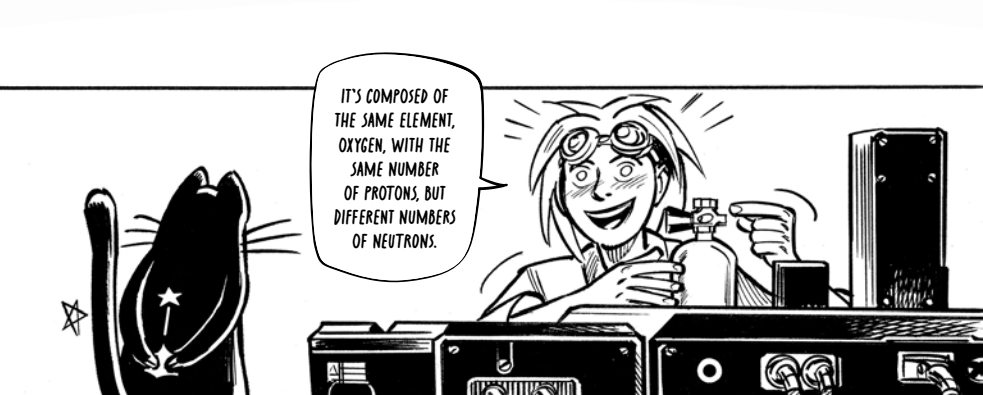
BY BURNING WITH OXYGEN  $^{18}\text{O}_2$ , WHICH IS DIFFERENT, BUT HAS THE SAME PROPERTIES AS  $^{16}\text{O}_2$ , WE CAN MEASURE THE OXYGEN THAT WAS PRESENT IN THE MOLECULES OF OUR SAMPLE.



ANALYSIS OF THE COMBUSTION PRODUCTS WITH OXYGEN  $^{18}\text{O}$ , ALLOWS US TO DISTINGUISH THE OXYGEN  $^{16}$  THAT WAS IN THE MOLECULES OF OUR SAMPLE FROM THOSE USED FOR COMBUSTION:  $^{18}\text{O}_2$ .

I WAS SAYING...






IT'S COMPOSED OF THE SAME ELEMENT, OXYGEN, WITH THE SAME NUMBER OF PROTONS, BUT DIFFERENT NUMBERS OF NEUTRONS.



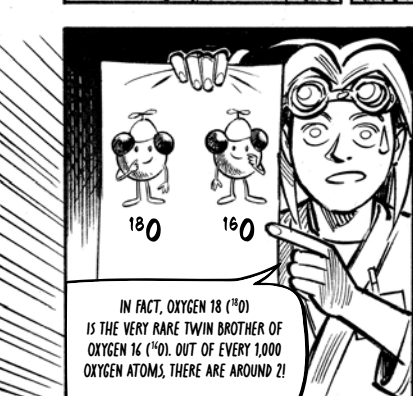
I DIDN'T GET IT...



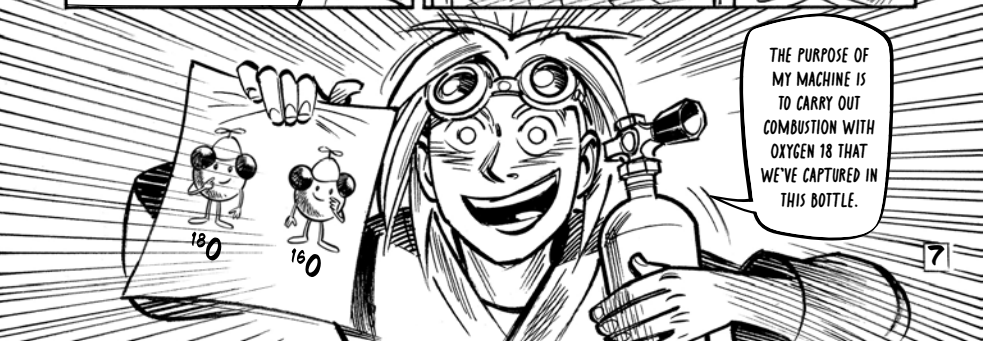
WHAT?



IF ONLY MY RESEARCH COULD BE USED FOR SOMETHING OTHER THAN TAKING YOUR NAP...

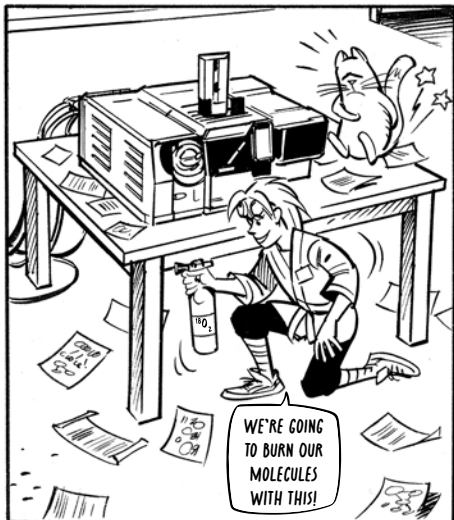
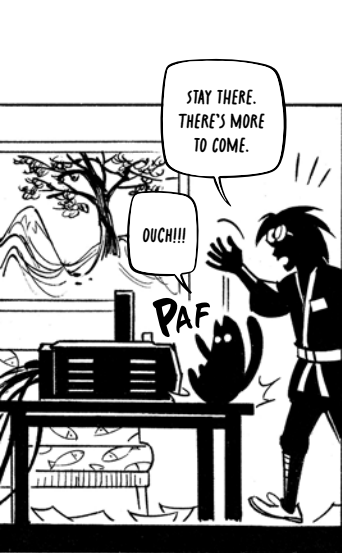


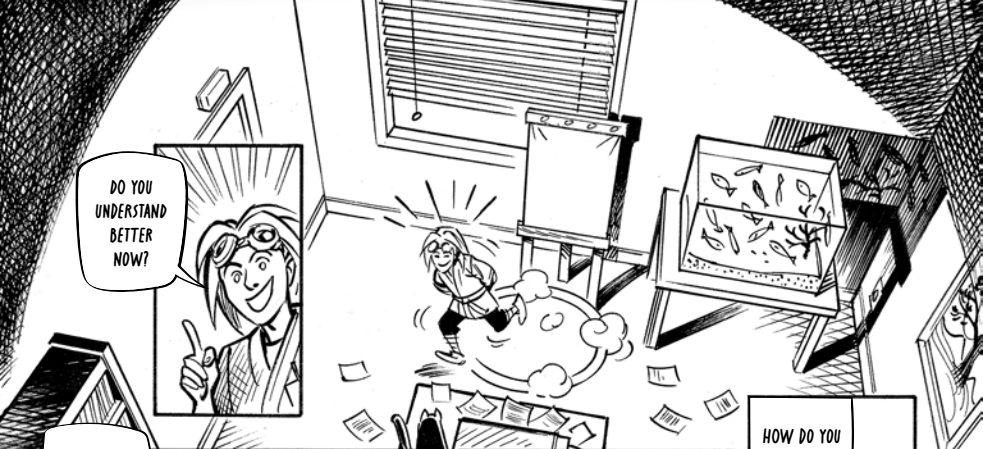
IN FACT, OXYGEN 18 ( $^{18}\text{O}$ ) IS THE VERY RARE TWIN BROTHER OF OXYGEN 16 ( $^{16}\text{O}$ ). OUT OF EVERY 1,000 OXYGEN ATOMS, THERE ARE AROUND 2!



THE PURPOSE OF MY MACHINE IS TO CARRY OUT COMBUSTION WITH OXYGEN 18 THAT WE'VE CAPTURED IN THIS BOTTLE.







DO YOU UNDERSTAND BETTER NOW?

AND THAT'S WHERE I COME IN! I'VE FOUND A TRICK!

IT IS THEREFORE IMPOSSIBLE TO ANALYZE OXYGEN BY BURNING IT WITH OXYGEN...

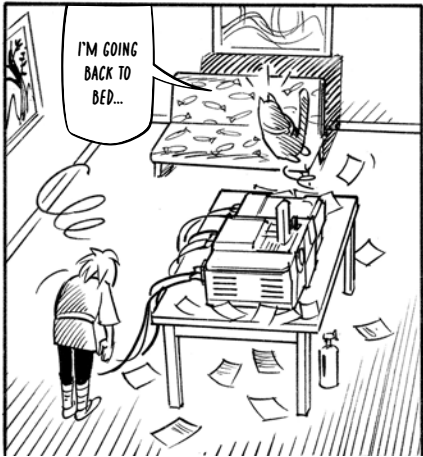


GREAT QUESTION! TO BURN MOLECULES, YOU NEED OXYGEN (O<sub>2</sub>).

SNAP!



HOW DO YOU MEASURE OXYGEN?



I'M GOING BACK TO BED...



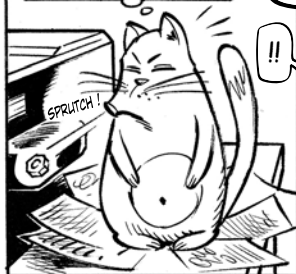
IT IS LONG...



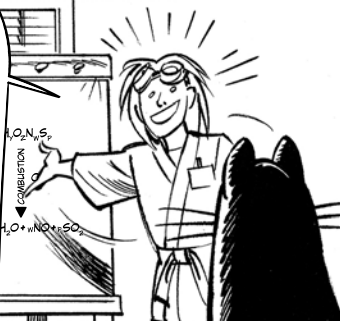
YOU'VE MADE A BIG FISH!

NO! LET ME FINISH!!!

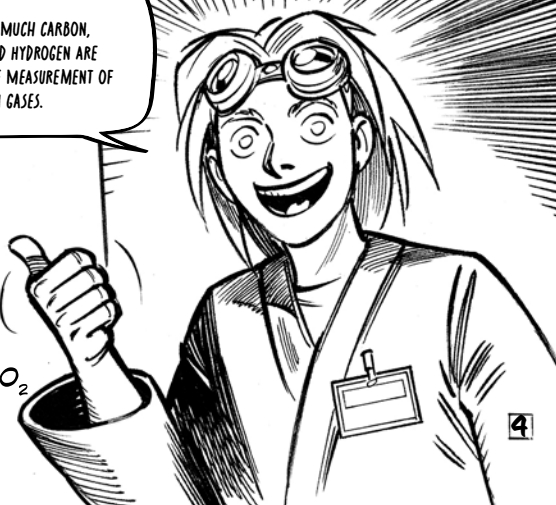
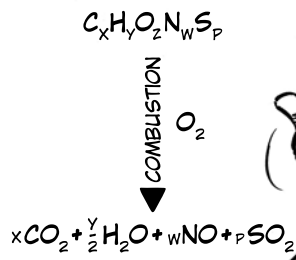
CAN YOU BELIEVE IT, WE'RE FINALLY GOING TO BE ABLE TO TACKLE THE PROBLEM OF IDENTIFYING AND QUANTIFYING OXYGENATED MOLECULES THAT ARE SO IMPORTANT TO THE ENERGY TRANSITION IN THE BIOFUELS, BIOPOLYMERS, OR EVEN BIOGAS, BUT ALSO FOR ENVIRONMENTAL AND BIOCHEMICAL ANALYSIS.

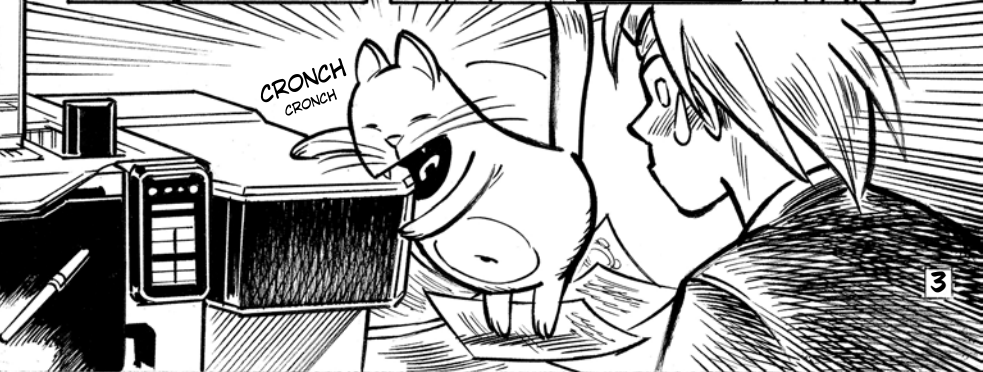
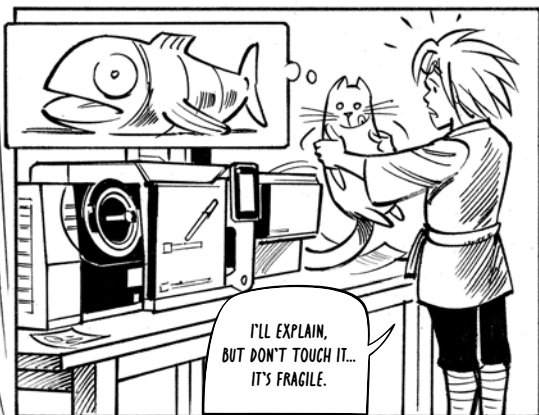
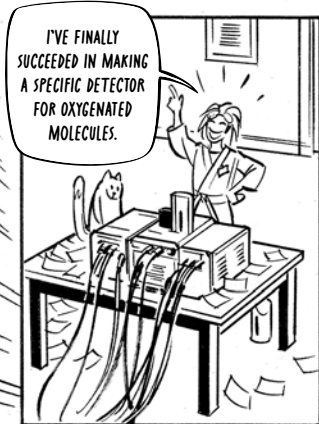
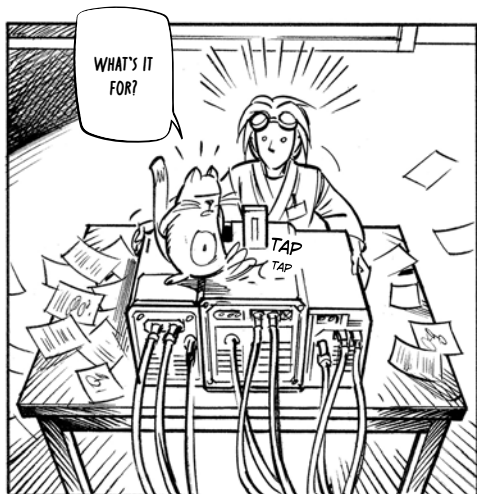


TO IDENTIFY AND QUANTIFY A MOLECULE, ONE OF THE MOST WIDELY USED TECHNIQUES IS TO SEPARATE IT FROM THE REST OF THE MIXTURE BY CHROMATOGRAPHY AND, AT THE END OF THE COLUMN, TO BURN IT. THEN ALL YOU HAVE TO DO IS LOOK AT THE COMBUSTION PRODUCTS.



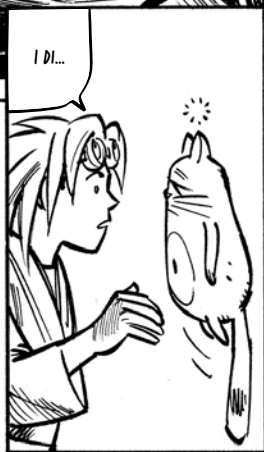
THIS TELLS US HOW MUCH CARBON, SULFUR, NITROGEN AND HYDROGEN ARE PRESENT, THANKS TO THE MEASUREMENT OF COMBUSTION GASES.

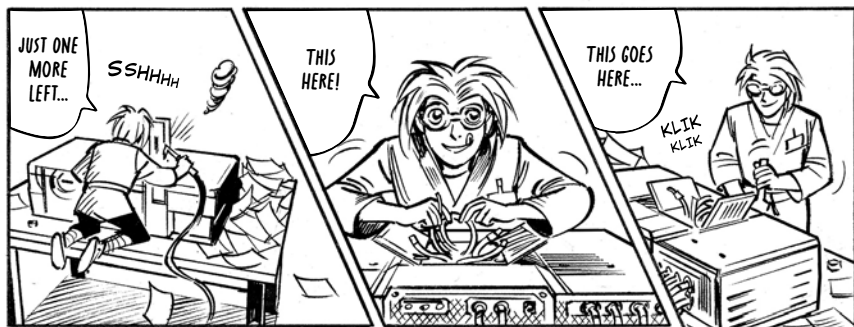
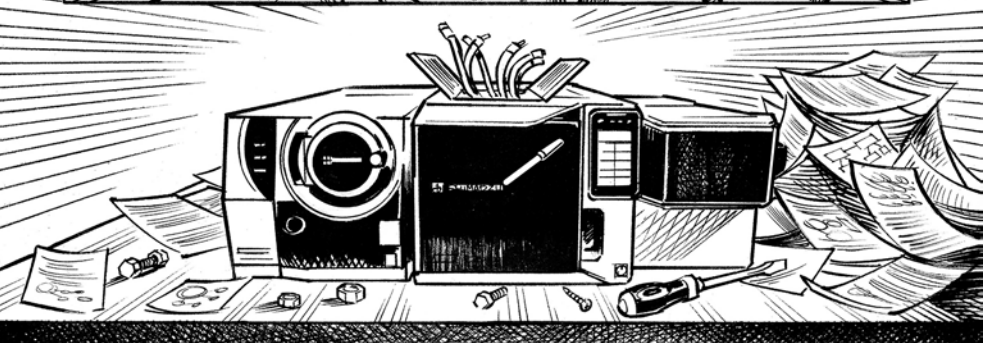
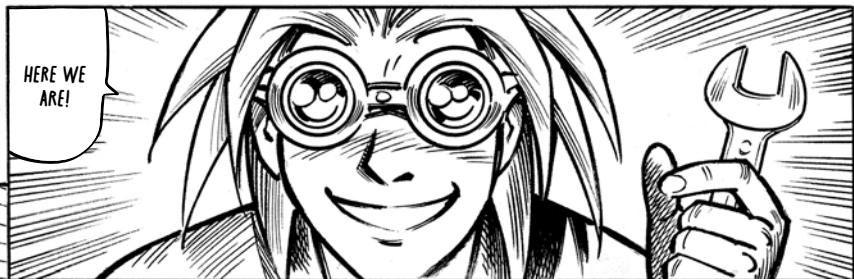






I'VE FINISHED IT!







**Brice Bouyssiere** is a professor of analytical chemistry at the institute of analytical sciences and physical chemistry for environment and materials (University of Pau and Adour Countries / CNRS), his research focuses on the characterization of complex matrices and development of hyphenated techniques between separation device and detection techniques. He is also Vice President Science with and for the society and open science at UPPA and co-founder and co-director of the iC2MC joint laboratory.

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**Jorge Ruiz Encinar** is Professor of Analytical Chemistry at the University of Oviedo in the north of Spain where he is co-director of the Analytical and Bioanalytical Spectrometry Group (GEAB). His research focuses on the development of instrumental approaches based on mass spectrometry and chromatography for the characterization and quantification of organic compounds, biomolecules and nanomaterials in energy, clinical and environmental applications.

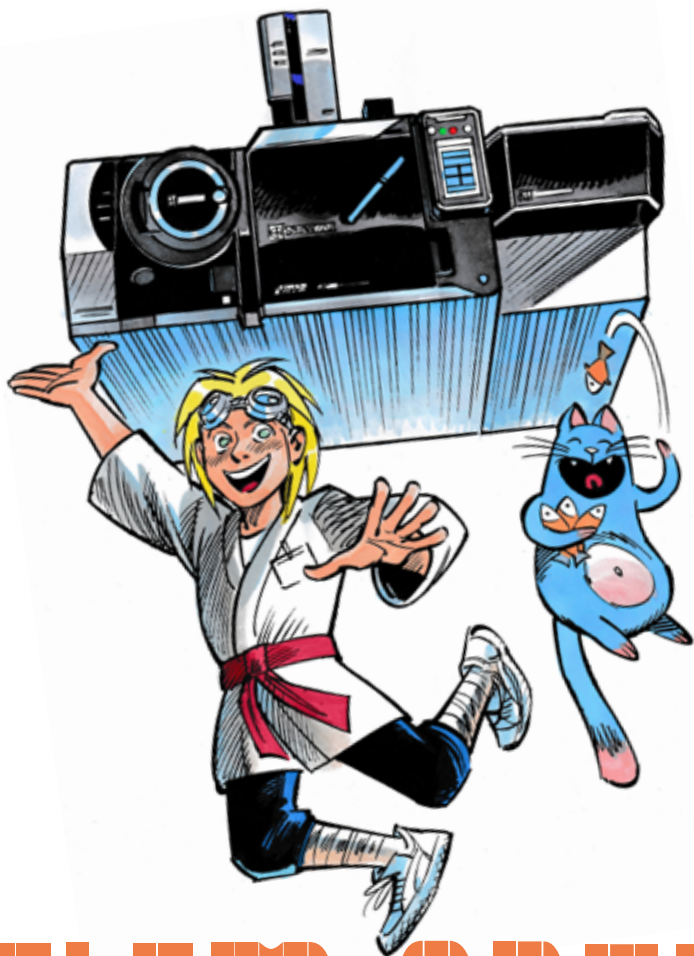


**Pierre Giusti** is a PhD in analytical chemistry, head of the TRTG separation and molecular identification service at TotalEnergies and Director of Research at the CNRS, he is co-founder and director of the iC2MC joint laboratory. He is interested in the molecular characterization of complex matrices in the field of energy and its decarbonation. He is a specialist in analytical sciences for TotalEnergies.

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**Mariella Moldovan** is an Associate Professor in analytical chemistry at the University of Oviedo. Her research focuses on the use of mass spectrometry as a detector for the absolute quantification of organic compounds without the use of specific standards in complex environmental and industrial applications.





# ELEM-SPOT

Revolution!

SCRIPT : KANKR  
DRAWING : DAMOUR