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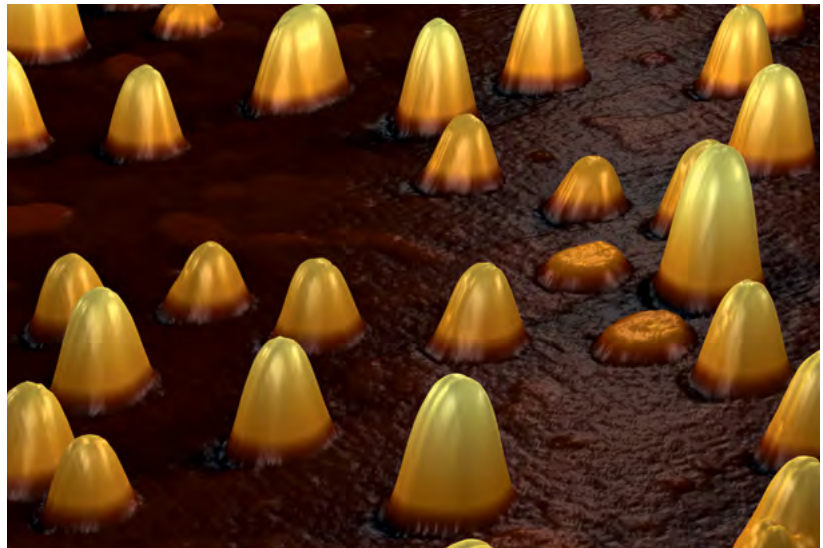
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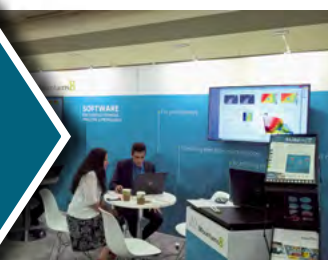


MountainsSPIP™ 8 including all the best features from the MountainsMap® SPM and SPIP™ software packages will be unveiled during the Materials Research Society Meeting & Exhibit in Boston, MA, USA in November 2018.

Find out all about this change and discover how using specialized software for your scanning probe microscopy images can take your data processing and analysis to a whole new level.

[... Turn to page 2 ...](#)

Meet us
EVENTS



We look forward to seeing you at:

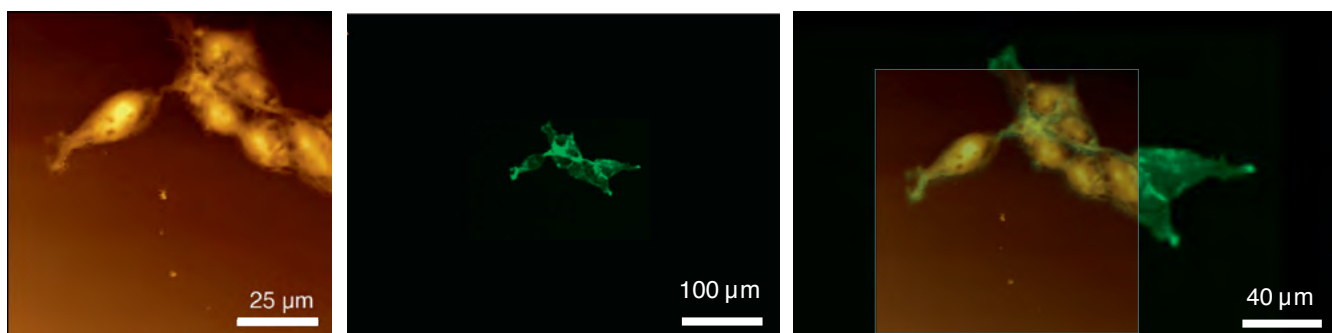
- ▶ **MRS** - Booth #716 - Nov 27-29, 2018 - Boston, MA, USA
- ▶ **Nanotech** - EU-Japan booth - Jan 29-Feb 1, 2019 - Tokyo, Japan
- ▶ **DPG Spring Meeting** - booth #98 - Apr 2-4, 2019 - Regensburg, Germany

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MOUNTAINSPIP 8™ WHAT'S INSIDE THE #1 TOOLBOX FOR SPM DATA?

Since SPM specialists Image Metrology and Digital Surf joined forces a few years back, development teams from both companies have been working hard to create the next generation of SPM image analysis software, based on the industry-standard Mountains[®] platform and including all the best SPIP[™] interactivity and analytical tools. The new product line, named MountainsPIP 8[™], will be unveiled at the **MRS Fall Exhibit in Boston on November 27-29** and made available to users in Q2 2019.

Here we premiere some of the benefits of this uniquely powerful toolbox for SPM data analysis.



(a) AFM topography of a cell

(b) Fluorescence image

Overlay of (a) on (b) performed automatically

1 - CORRELATIVE ANALYSIS

Researchers wishing to explore a sample beyond the limitations of one single instrument technology need look no further than MountainsPIP 8[™].

Whether working with data from 3D optical profilers, AFM, SEM, fluorescence, Raman, IR or other microscopes, users benefit from powerful detection tools which allow them to easily manage data at different scales (see image above).

Density maps, SEM, fluorescence and other images can easily be overlaid on surface topography to facilitate the correlative study of features.

2 - FORCE SPECTROSCOPY

Characterizing molecular interactions at the nanoscale using atomic force microscopy (AFM) is a key application in the fields of materials and life sciences.

MountainsPIP[™] contains all the features necessary for viewing, processing and analyzing force curves and force volume images.

This includes tools for correcting data, creating interactive parameter maps and managing large collections of curves.

All parameters and results can be exported to Excel at the touch of a button.

3 - PARTICLE ANALYSIS

MountainsPIP[™] takes particle analysis to a whole new level. Combining all the best Mountains[®] and SPIP[™] tools, this tool allows users to easily detect and quantify features of any shape and size on virtually any surface.

It is possible to choose which layer of data to use for feature detection then select an appropriate detection method (threshold, watershed, edge or circle detection).

When it comes to quantification, over 70 parameters (area, perimeter, diameter etc.) are available. Analyze the sample as a whole or just click on any individual particle to see parameters instantly displayed!

=> SEE PAGE 8 FOR MORE DETAILS.



4 - MULTI-CHANNEL FILE MANAGEMENT & PROCESSING

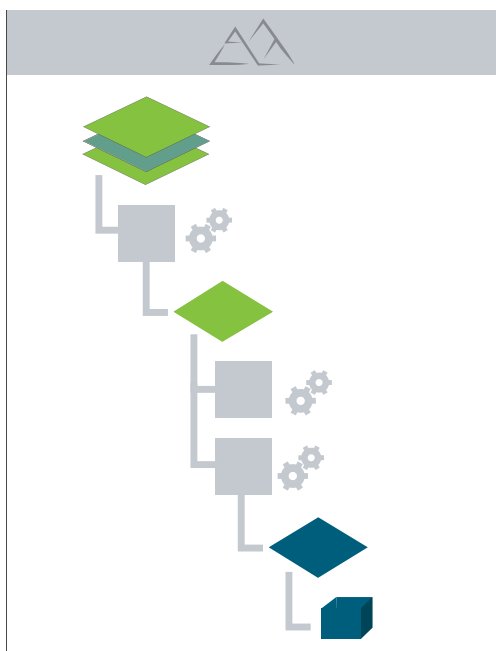
SPM users often work with data comprised of multiple images (current, phase, thermal etc.) obtained using different scanning modes.

MountainsSPIP™ manages multi-channel files in exactly the same way it manages single-channel data, allowing users to switch easily from one channel to another during each and every stage of image processing.

5 - TOTAL TRACEABILITY

Thanks to its unique analysis workflow (see image below), MountainsSPIP™ makes it easy to keep track of analysis steps already applied to data and instantly revert back to any step in the process.

Even better, any step can be edited, resulting in all dependent steps being automatically recalculated.



6 - PRODUCTIVITY BOOSTED

As in previous versions of Mountains' software, MountainsSPIP™ allows users to save work and pick up where they left off next time.

Repetitive analysis routines, following the same steps again and again, can be automated with robust tools including templates.

7 - COMPATIBLE WITH ANY SPM

MountainsSPIP™ is capable of processing data from any brand or type of scanning probe microscope (AFM, STM, SNOM, etc.) The software can open over 170 different file formats covering various data types (profile, surface, image, multi-channel, force curve, hypercube, etc.).



Bruno Grandidier, Directeur de Recherche CNRS, IEMN

8 - RENOWNED EXPERTISE IN SURFACE ANALYSIS

Digital Surf and Image Metrology have many years experience developing surface imaging & metrology software for the global industrial and scientific communities. Both companies have research partnerships with leading laboratories worldwide. The majority of national metrology institutes (NIST in the USA, NPL in the UK, LNE in France etc.) rely on the expertise and precision of Mountains' and/or SPIP™ software.

9 - TRUSTED BY THE BEST

Digital Surf's main focus is on working as a partner with instrument manufacturers worldwide, in the fields of surface metrology and microscopy.

Mountains' software is now offered by over 50 profilometer and microscope manufacturers, embedded in their equipment.

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THE STORY BEHIND MOUNTAINSSPIP[™]



Digital Surf and Image Metrology joined forces in July 2014.

In the run-up to the release of MountainsSPIP 8[™], Christophe Mignot, Digital Surf CEO, explains the reasons behind this merger and what it means for current SPIP[™] and Mountains[®] users.

DIGITAL SURF AND IMAGE METROLOGY MERGED IN 2014. CAN YOU EXPLAIN THE LOGIC BEHIND THIS?

In July 2014, Digital Surf acquired 100% of shares in Image Metrology, a Danish company founded in 1998, creator of SPIP[™] ("Scanning Probe Image Processor") software.

SPIP[™] is the market-leading image analysis software for the SPM world (Atomic Force Microscopes, Scanning Tunneling Microscopes etc.)

Digital Surf, a company founded in 1989, is the editor of Mountains[®] software, leading analysis software for contact (stylus) and non-contact (optical) profilometers.

Most profilometer manufacturers now offer Mountains[®] to their customers, either as an option or an embedded standard component.

Profilometers and SPMs share a lot in terms of surface analysis needs: for instance, interactive 3D rendering, form removal, filtering and roughness analysis can be required when working with data from either technology.

However each instrument family also requires specific optional analyses e.g. automotive surface texture parameters for profilometers or force curve analysis for AFMs.

Image Metrology and Digital Surf were not directly competing as we were focusing on different markets. However over the years, it appeared that we had a lot of scientific enthusiasm and long-term expertise that we could pool for the benefit of our respective customers.

Merging the two products was an opportunity to serve the surface analysis community more globally and in a better way, with tools for analysis from the nanometer scale to the millimeter scale.

In parallel, over the last 10 years, Digital Surf has been driving an internal R&D program with the idea of allowing Scanning Electron Microscopy to move from 2D grayscale images to 3D color images. Currently this technology has been adopted by the four biggest SEM manufacturers.

As a result of both these internal and external developments, Digital Surf is planning to launch the new Mountains[®] 8 range in Q2 2019.

Not only will Mountains[®] 8 be the most advanced software package for each type of surface or image analysis, but laboratories working with several different types of instrument (profilometer, microscope, SEM, AFM, spectral analyzer etc.) will be able to benefit from a unique synergy between all their instruments.

WHAT IS MOUNTAINSSPIP 8[™]?

MountainsSPIP 8[™] is a new product based on the Mountains[®] platform.

It incorporates the advantages of both Mountains[®] 7.4 and SPIP[™] 6.7 in a single product and adds many new features.

Mountains-SPIP[™] is the Mountains[®] 8 software product line dedicated to SPM instruments. It will replace both MountainsMap[®] SPM 7 and SPIP[™] 6.

WHAT ARE THE ADVANTAGES BROUGHT BY THE SPIP[™] AND MOUNTAINS[®] PLATFORMS?

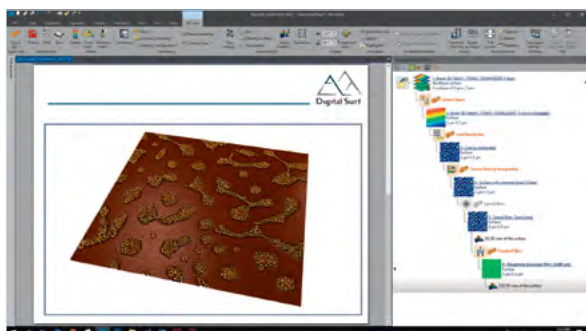
Of course, it would be easy to assume that Mountains[®] 7 being the expert for surface analysis on profilers (and SEMs) and SPIP[™] 6 being the specialist for SPM image analysis, we would just merge these two characteristics to form the DNA of our new product. However, there's more to it than that.



Development teams in Besançon and Copenhagen have been working hard to bring customers the next generation of SPM image analysis software

The approach used in SPIP™ is more interactive and direct than in Mountains®. For instance, extracting a cross-section profile or a sub-area from a surface or leveling a topography are one-click operations in SPIP™, whereas they follow a longer sequence in Mountains® 7.

On the other hand, Mountains® 7 is very good at automation, traceability and publication, thanks to its unique document-based architecture and its clear and visible workflow. In Mountains® 7, the user can permanently monitor the operations applied, modify any of them at any time, use the work done as a template at any time and save or export work to Microsoft Office or other common programs in just a few clicks.



The Mountains® 8 interface features a unique analysis workflow (to the right)

It has been a tremendous challenge to marry advantages of both software programs into a single product, as the philosophy of the two predecessors was really different, but we eventually got there! Mountains® 8 is as immediate as SPIP™ 6 and as traceable and automatable as Mountains® 7.

CAN YOU GIVE A FEW SPECIFIC EXAMPLES OF FEATURES?

An important advantage for Mountains® 7 users will be new tools for Particle Analysis. Image Metrology did a brilliant job on this in SPIP™ and now all Mountains® users will have access to that.

Conversely, Digital Surf really nailed multi-channel SPM image management. Multi-layer images are processed as simply as standard images in Mountains® 7, whereas this required windows synchronization mechanisms in SPIP™. Those using multi-channel microscopes will see their productivity increase significantly when upgrading to MountainsSPIP 8™.

However, Mountains® 8 is much more than just SPIP™ 6 and Mountains® 7 advantages put together. The new platform offers other new advantages. For instance users have been asking us for a while for a complete undo/redo function everywhere in the document: DONE!

HOW WILL THE NEW MOUNTAINS® 8 RANGE BE STRUCTURED?

The new Mountains® 8 range will have three main product lines:

- ▶ **MountainsSPIP™ 8** is dedicated to SPMs, mainly Atomic Force Microscopes and Scanning Tunneling Microscopes. This line is to be unveiled at the MRS Fall Meeting in Boston this month (November 2018).
- ▶ **MountainsSEM™ 8** is the product line dedicated to Scanning Electron Microscopy and was shown at the Microscopy & Microanalysis show in Baltimore last August.
- ▶ **MountainsMap™ 8** is software dedicated to contact and optical profilers. This new product will be unveiled at the Control quality assurance show in Germany in May 2019. It will be a significant step forward from MountainsMap™ 7 for our profiler users.
- ▶ **MountainsUniversal™ 8** will group of these three product lines into a single package allowing multi-instrument synergy. It is a high-end product line dedicated to core instrument facilities in academia and industry.





IEMN

Laboratories working with several different instrument technologies will benefit from Mountains[®] 8 unique synergy

All four software lines will come with a dedicated choice of optional modules, such as specific analysis tools for the automotive industry or powerful spectral data cube analysis for chemical surface mapping in microscopy.

DO YOU EXPECT SPIP™ 6 USERS TO BE AT EASE QUICKLY WITH MOUNTAINSSPIP™ 8?

Obviously MountainsSPIP™ will be a big step forward for users of SPIP™ 6 (and earlier versions). It will require more time and effort for them to find their feet than for Mountains[®] 7 users. We realize that and we are committed to making the shift as easy as possible.

Mountains[®] 8 will allow users to start from tutorial examples. Not tutorials that you use to understand, then close before applying to your own work, but actual useful examples you can use yourself to start with (including comments and explanations that you can switch off and on as you please). You can easily replace example data with your own data, save and retrieve your work.

We are producing a specific set of examples dedicated to guiding former SPIP™ 6 users.

Mountains[®] is very consistent. It is quite different from any other image analysis programs. But once you have got used to the basic concepts and names (such as "document", "studiable" and "operator"), the software behaves the same for all data types.

There is a small effort involved during the first five minutes, but then the gain in productivity is huge. Also, as Mountains[®] reproduces the familiar layout of desktop publishing software, if you are used to products like PowerPoint[®] or Word[®], you

will quickly be at ease with our powerful analysis documents.

MountainsSPIP™ will be available in 11 languages, including on-screen help, so most users will be able to work in their native language.

Last but not least, we are training our customer support people so that they fully understand the differences SPIP™ users will face when using MountainsSPIP™. So, they are ready to help and share their enthusiasm for the new product! Customers should not hesitate to call our support team for even the smallest concerns.

DO YOU HAVE A MESSAGE FOR THE 15,000 EXISTING MOUNTAINS[®] USERS?

The merger of SPIP™ and Mountains[®] has been a long process and has delayed the release of version 8, but it was worth the wait. SPIP™ has come as a breath of fresh air, with attractive concepts that will now be part of Mountains[®]. And it is now our intention to recover the pace of new major versions.

With SPIP™ joining us, the community broadens, and synergy between instruments and applications once again increases. Whatever surface analysis instrument you have, you know you can trust Mountains[®] to stay at the forefront, as 50+ instrument manufacturers do already.

We would like to thank our users and integrators for their loyalty and trust and we pledge to keep up the hard work in the future!

LINKS

- ▶ www.digitalsurf.com/software-solutions/spm/
- ▶ www.imagemet.com/products/mountainsspip-8/

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JAN F. JØRGENSEN, CEO OF IMAGE METROLOGY



Image Metrology has been supplying SPIP™ data analysis software for scanning probe microscopy to scientists in academia and industry for the last two decades.

The company founder and CEO, Jan F. Jørgensen, tells us more.

CAN YOU INTRODUCE YOURSELF & IMAGE METROLOGY TO OUR READERS?

After a degree in biomedical engineering, I worked as a software engineer for hi-tech analytical companies. I completed a PhD in cooperation with IBM and the Danish National Metrology Institute (DFM), where I worked on fundamental metrology, standards and technology.

I founded Image Metrology in 1998 with SPIP™ as its primary product. The development of SPIP™ started as part of my PhD project. Our focus has always been on providing intelligent image processing techniques that facilitate the measurement and analysis of SPM images in a way that is as accurate as possible whilst being user-friendly.

WITH THE MERGE OF SPIP™ & MOUNTAINS™ WHAT ARE THE BENEFITS FOR SPIP™ USERS?

SPIP™ users are set to gain significantly in productivity. MountainsSPIP™ allows users to save, close and reopen their work at any time. There are many tools for automating repetitive work and speeding up analysis processes. I also think many users will appreciate being able to export data as a report in PDF format at any time.



WHICH SPIP™ FEATURES WILL MOUNTAINS™ USERS MOST BENEFIT FROM?

In addition to improved interactivity I would highlight three features.

- ▶ Particle analysis is of great interest for most microscopists and they can now take advantage of the unique particle analysis tools coming from SPIP™.
- ▶ State-of-the-art calibration tools used by top-level metrology institutes will now be available for quality assurance and users requiring a very high level of accuracy.
- ▶ SPIP™ force spectroscopy analysis tools, regarded as the reference in this domain, will be of great benefit for frontier researchers working in material and life sciences.

DO YOU HAVE A MESSAGE FOR CURRENT SPIP™ USERS?

During the upcoming year, we will be 100% committed to accompanying each SPIP™ customer in their first steps with MountainsSPIP™. The interface and features of MountainsSPIP™ are closer to the current versions of MountainsMap®, so to help SPIP™ customers make the transition, we are compiling a series of tutorials and examples that we will soon make available to them.

I would also like to take this opportunity to remind SPIP™ users that customers who have an active maintenance service at the time of the MountainsSPIP 8™ release will be entitled to an upgrade to this new product, absolutely free of charge. So, it is important to make sure your SPIP™ maintenance service is renewed, even if it expired a long time ago.

We would be happy to answer any questions, so please feel free to contact info@imagemet.com.

“

PARTICLE ANALYSIS HAS NEVER BEEN EASIER

Particle analysis is used in research and industry across many fields ranging from quality control of structured materials (metal alloys etc.) to characterization of nano-structure assemblies. Mountains® 8 brings an updated, extensive tool set for quickly identifying and quantifying features in any image or on any surface.

SO WHAT'S NEW?

In Mountains® 8, the very best SPIP™ and Mountains® features have been merged to bring users top-of-the-range tools for particle analysis.

This means access to a range of detection methods, improved interactivity and new options for calculating and displaying data.

HOW ARE PARTICLES DETECTED?

Mountains® 8 particle analysis offers four feature detection methods based on different segmentation principles.

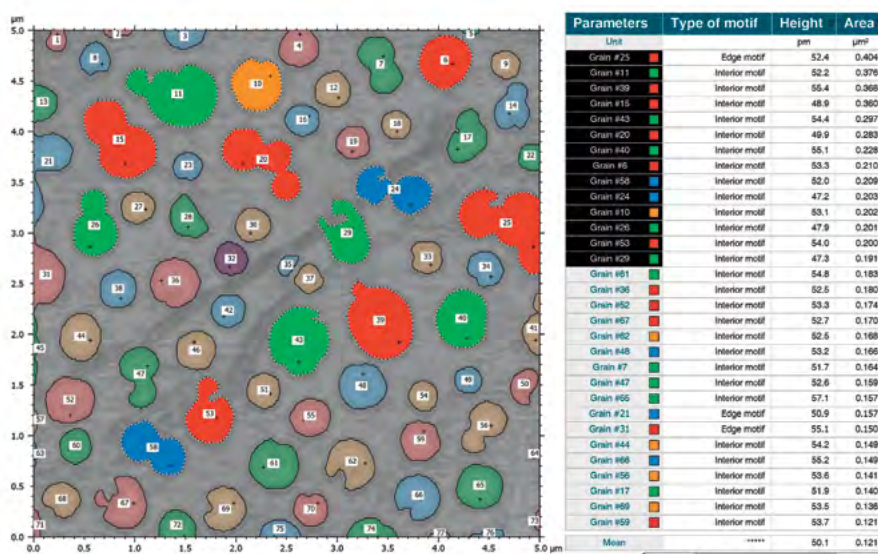
- ▶ threshold segmentation (detect particles using user-defined thresholds)
- ▶ watershed segmentation (using the method defined in the ISO 25178-2 standard)
- ▶ edge detection (apply an edge detection filter)
- ▶ circle detection (detect round or spherical particles).

WHAT ARE THE DISPLAY OPTIONS?

Users can choose amongst a wide range of graphical representations and customize how they wish to display analysis results:

- ▶ overlay (see particles in pseudo-color)
- ▶ motifs (see on a monochrome background)
- ▶ colored (use color and manage transparency)

The particles can be classified and colored based on user-defined settings; various charts and statistical results are available.



Above: Mountains® 8 particle analysis

Click on any particle and instantly access parameters such as height, area, volume etc.

WHAT DO YOU MEAN BY IMPROVED INTERACTIVITY?

Particle analysis is fully interactive. You can click on any individual particle and instantly jump to the relevant row of the parameters table and vice-versa.

Available parameters include: motif type (open or closed), height, area, volume, X, Y and Z extremum, number of neighbors, pitch, coflatness, perimeter etc. Mean morphological parameters can also be displayed for the entire image.

All results can be exported directly to Excel and Word or in PDF format.

AND WHAT IF I'M USING MULTI-CHANNEL DATA?

No problem! For multi-layer data, a selection tool allows users to choose which layer to use for feature detection and parameter calculation.

=> CHECK OUT THE VIDEO

www.digitalsurf.com/particle-analysis-in-mountains-8

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5 REASONS IT MAY MAKE SENSE TO RENT MOUNTAINSMAP®

Investing in professional scientific software such as MountainsMap® for surface analysis and metrology can be a complex decision to make. Perhaps you're not sure if you are going to get sufficient use out of the product or maybe you're working on a time-limited project? Could a subscription or "rental" be the answer?

1 - YOU ONLY NEED THE SOFTWARE FOR A LIMITED TIME

If your software needs change from project to project depending on what you are working on, renting MountainsMap® may be the solution for you.

2 - YOU WANT TO TEST THE SOFTWARE BEFORE MAKING THE DECISION TO BUY

Sometimes a 30-day free trial just doesn't give you enough time to make your decision.

Subscription or "rental" licenses are available for periods of 3 months or more. They include access to whatever functions you need, free updates as well as help and technical support. If you decide to buy MountainsMap® at the end of the rental period, 30% of the fee you paid is converted into a discount.

3 - YOU NEED TO LOWER UPFRONT COSTS

Buying a perpetual software license can be a big upfront investment for some companies and research facilities. Renting MountainsMap®, on the other hand, allows immediate full access to the software at a lesser cost.

4 - YOU NEED THE SOFTWARE FOR YOUR PHD OR MASTER'S

MountainsMap® is often used by students completing a thesis or a Master's project.

Renting the software means you aren't committed beyond the end of your studies. A rental license gives you full freedom to use and publish the results of your work.

5 - YOU BILL BACK TO CLIENTS

Renting MountainsMap® means you can directly pass the cost to clients. You can treat access as an operating expense rather than a capital expense.

Maxime Berthe, Ingénieur de Recherche CNRS, IEMN



SO, HOW DOES IT WORK?

Anne Berger,
direct sales manager



"It's actually pretty straightforward. You select the configuration you want (product and optional modules) and decide how long you wish to use MountainsMap®. This could be 3, 6 or 12 months for example.

After signing an agreement, you will receive a USB dongle. You pay at the beginning of each quarter (by wire transfer, Paypal or credit card) and receive an activation code by e-mail for each payment.

You will have full access to our extensive help documents as well as to technical support provided by our team of experts.

Software updates (including major updates) are included in all rental packages at no extra cost. You may also extend your rental period at any time"

=> GET IN TOUCH TO ASK FOR A QUOTE:



sales@digitalsurf.com

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MOUNTAINS® USED IN STUDY ON WORLD'S OLDEST DRAWING

Nature, the International Journal of Science, recently revealed the discovery by an international team including scientists from the PACEA (CNRS/University of Bordeaux/French Ministry of Culture) research unit of the oldest drawing known to man.

Among the tools used to bring this unique treasure to light, SensoMap software, based on Mountains® technology helped researchers to precisely characterize surface features and confirm the drawing was indeed done intentionally.

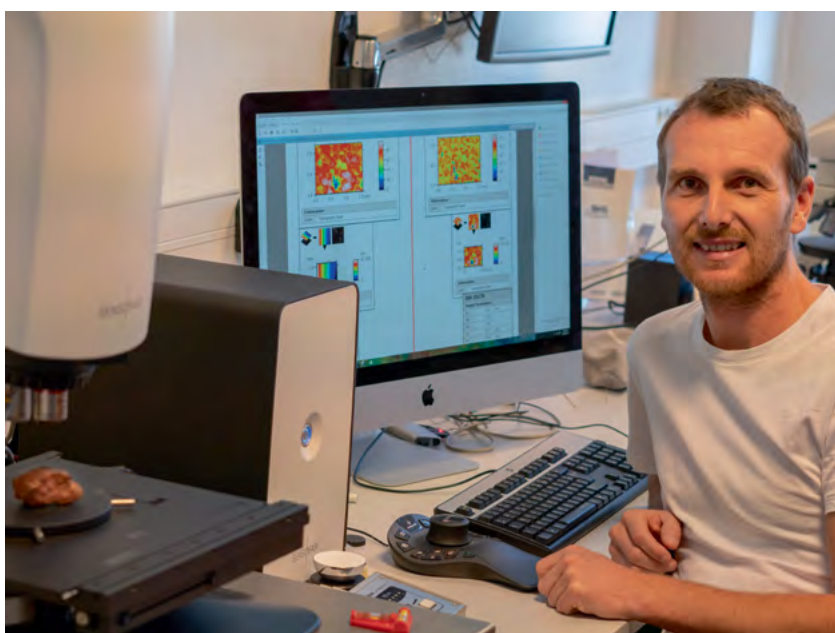
THE WORLD'S EARLIEST DRAWING IS 73,000 YEARS OLD

The oldest known abstract drawing, made with ochre, was found in a South African cave on a pebble retrieved from 73,000-year-old deposits. A crosshatch of nine lines purposefully traced with a piece of ochre having a fine point and used as a pencil, this work is at least 30,000 years older than the earliest previously known abstract and figurative drawings executed using the same technique.

CONFIRMING THE VALIDITY OF THE DISCOVERY

A major methodological challenge was to prove these lines were deliberately drawn by humans. First, researchers reproduced the drawing discovered using various techniques: they tried fragments of ochre with a point or an edge and also applied different aqueous dilutions of ochre powder using brushes.

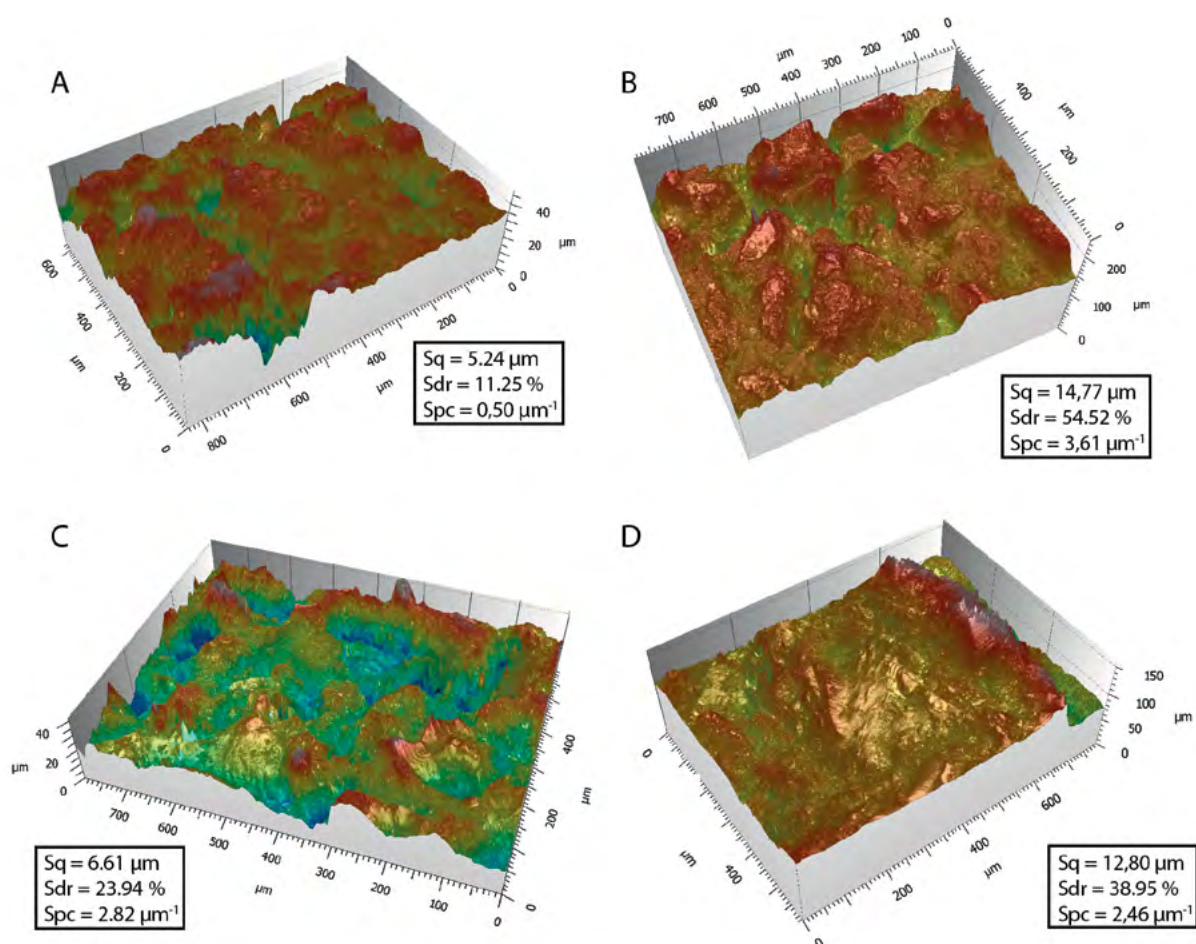
Using techniques of microscopic, chemical, and tribological analysis, they then compared their drawings to the ancient original. Their findings confirm the lines were intentionally drawn with a pointed ochre implement on a surface first smoothed by rubbing. Both ISO parameters and SSFA analysis clearly demonstrated that the drawn surface was significantly smoother than the other parts of the flake and the other artifacts from the cave.



Above. Dr Alain Queffelec of the University of Bordeaux, one of the researchers involved in the groundbreaking study.



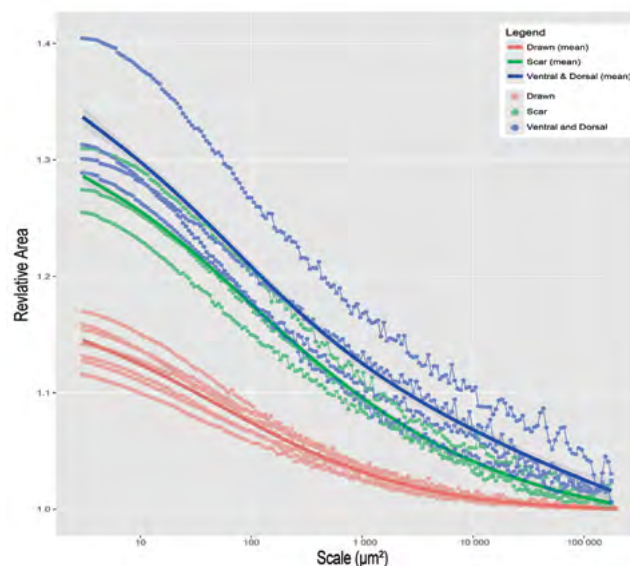
Above. This silcrete flake displays a drawing made up of nine lines traced on one of its faces with a sharp piece of ochre.
© d'Errico/Henshilwood/Nature



Above & right. Surface analysis was performed using SensoMap software (ISO and SSFA parameter calculations).

SURFACE ANALYSIS TOOLS USED

Among the tools used to bring this exciting new discovery to light, SensoMap software, based on Mountains' technology allowed archeologists to reveal that the pebble in question was probably originally part of a large ocher grindstone, the surface of which may have been completely covered by a drawing which the fragment discovered would have been part of.



READ MORE

- **An abstract drawing from the 73,000-year-old levels at Blombos Cave, South Africa.** Christopher S. Henshilwood, Francesco d'Errico, Karen L. van Niekerk, Laure Dayet, Alain Queffelec & Luca Pollarolo. September 12th, 2018, Nature : <https://doi.org/10.1038/s41586-018-0514-3>

WATCH THE VIDEO

- <https://youtu.be/ntLBvNgDn7Y>

CONTACT

- Francesco d'Errico - francesco.derrico@u-bordeaux.fr
- Alain Queffelec - alain.queffelec@u-bordeaux.fr

“

SURFACE TEXTURE PARAMETERS WHY SO COMPLEX?



Surface texture has always been a difficult discipline to master, due to complex filtration conditions, numerous parameters and complicated notations. This complexity is probably why users often only retain the Ra parameter (and forget about filtration). To add to this, the new areal standard ISO 25178 adopts a different system from the profile standard.

ISO expert **François Blateyron** looks at the big picture and how this could be simplified in the future.

WHY THREE VARIANTS FOR PROFILE PARAMETERS?

Profilometry was born in the 1940s, pushed by the urge to improve the quality and efficiency of mechanical components used in weapons, planes, vehicles and ships during World War II. The foundations of the discipline were forged by mechanical engineers for mechanical engineers. After the war, it was further developed to accompany the growth of the automotive industry and later other industries such as medical implants, appliances and electronic devices.

The nature of surface texture is based on the lateral wavelength of irregularities. Geometrical form and form errors are excluded from surface texture, leaving three components: **primary profile, roughness profile and waviness profile**, each separated by filters. Roughness is by far the most common surface characteristic, having an important impact on surface functions such as wear or friction. Waviness is key for sealing and sliding functions.

ISO 4287		ISO 4287		ISO 4287	
Pp	3.834 μm	Rp	1.991 μm	Wp	1.793 μm
Pv	10.377 μm	Rv	5.606 μm	Wv	1.648 μm
Pz	14.211 μm	Rz	7.597 μm	Wz	3.440 μm
Pt	14.211 μm	Rt	11.850 μm	Wt	3.440 μm
Pa	1.255 μm	Ra	1.078 μm	Wa	0.481 μm
Pq	1.780 μm	Rq	1.482 μm	Wq	0.627 μm
Psk	-1.722	Rsk	-1.461	Wsk	0.086
Pku	7.669	Rku	5.720	Wku	3.295

Surface texture specifications are expressed via parameters that imply filtration conditions in their name. For example, the "quadratic mean height" parameter corresponds to Rq on the roughness profile, Wq on the waviness profile and Pq on the primary profile. The definition of these three parameters is the same, but the profile on which they may be applied is filtered differently. **Thirteen**

parameters defined in ISO 4287:1996 suddenly become thirty-nine!

But that's not all. Some of these parameters are calculated by small segments called **sampling lengths** and averaged, and some are calculated over the **evaluation length**. (It is interesting to note that this complex method was however not used in the American ASME B46.1 standard which is much more practical than the ISO standard although perhaps less rigorous. See our Surface Metrology Guide for more details (<https://guide.digitalsurf.com/en/guide-profile-parameters.html>).

WHY SO COMPLEX?

There are historical reasons for this complexity, one of them being that, in the 1980s, the dispersion of results between profilometers of different kinds required stabilization by an averaging process.

WHY ONLY ONE VARIANT FOR AREAL PARAMETERS?

Areal surface texture started in the 1990s by simply extrapolating profile parameters to the third dimension. Then, the European project **Surfstand** drafted the future standard and justified the benefit of areal analysis by better stability and better functional correlations. After a period where areal parameters were called sRa, sWa and sPa, it was finally decided that a single symbol (Sa) should be used regardless of filtration conditions. For more details see <https://guide.digitalsurf.com/en/guide-surface-texture.html>.

One of the main reasons for this was that, on a rectangular surface, it may be possible to have

a roughness-like surface in one direction and a waviness-like surface in the perpendicular direction. Also, new analysis methods such as multi-scale exploration of the surface or morphological filters generate different kinds of filtered surfaces that are neither roughness nor waviness.

ISO 25178 was developed with the idea that "Nature is tridimensional" and new concepts have been introduced to prepare a **standard of the new millennium**. Improved mathematical foundations and simpler concepts have been used, with the intention to these should also apply to existing profile standards when they become due for revision.

WHY NOT SIMPLIFY IN THE FUTURE?

The revision of profile standards has now started with the draft of **ISO 21920** parts 1-3. **Why not use this as an opportunity to modernize our standard portfolio?** Why not replicate the general concepts introduced in the areal standard and get rid of the most complex parts of our old standards? The debate is open at ISO but old habits die hard in some industries.

For sure, today's surfaces are much more complex than in the past. They are often structured or stratified to program a specific function. Hydrophobic surfaces use micropillars, nanoprinting of periodic structures allow the surface to be colored without ink or paint, laser textured surfaces optimize friction and save energy, etc.

These surfaces require modern analysis tools, such as watershed segmentation, biorthogonal wavelets, bandpass filtering, multi-scale geometric analysis, autocorrelation function, etc. Profiles and surfaces can be filtered with many different filters (see ISO 16610 series), each having specific strengths for specific applications. **The roughness/waviness duality is no longer valid for complex surfaces** although it remains useful on isotropic surfaces obtained by traditional manufacturing processes.



SO, HOW CAN WE EXTEND OUR STANDARDS TO EMBRACE THESE NEW APPLICATIONS?

Let's imagine defining a single notation for surface texture parameters, regardless of how the surface is measured and how measured data is modified and filtered. Let's call these parameters **S_x** with **S** to symbolize **surface** and a subscript **x** to define the type of parameter. For example:

root-mean-square height <profile>	root-mean-square height <areal>
$Sq = \sqrt{\frac{1}{l} \int_0^l z(x)^2 dx}$	$Sq = \sqrt{\frac{1}{A} \iint_A z(x,y)^2 dx dy}$

And one could also imagine similar definitions on roundness profiles, cylinders, freeform surfaces, parametric profiles, etc. This would avoid multiplying parameter names as we apply them to different data types.

Of course, form association (leveling, form fitting) and filtration conditions (bandwidth or scale limitation) should be given explicitly with the specification or in a condition box referenced on the specification symbol. But this would be clearer than relying on defaults that the majority of users barely understand.

Existing drawings using old parameters and notations could still be used. They refer to former standards. But why not use simpler, clearer and more flexible notations for new standards crafted for modern surfaces produced by new manufacturing processes and by those yet to come?

YOUR VIEW IS IMPORTANT!

Simplification is one of the hot topics currently undergoing discussion at ISO TC213/WG16. Users are invited to contribute to this discussion, and not only those from the mechanical or automotive industries (ISO standards are now used much more widely than these).

As an active member of this working group, I would like to hear feedback from users in many different fields of application who use profile and/or areal parameters and who struggle with the complexity. I would like to hear from teachers, metrologists, engineers and researchers.



Please do not hesitate to send us your thoughts and ideas, via email or our social network pages:



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EVENTS HIGHLIGHTS

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AN EXCITING SUMMER SHOW SEASON ALL AROUND THE WORLD FOR DIGITAL SURF

The Microscopy & Microanalysis Meeting was held this year in Baltimore, MD (USA) from August 5 to 9. With almost 1,700 attendees, the M&M conference strengthened its reputation as the world's largest scientific meeting dedicated to microscopy and microanalysis. On a new look booth, Anne, Cyrille and François P. were pleased to provide visitors with a sneak preview of Mountains⁸ features and to provide in-depth information on 3D photogrammetry in SEM and image colorization during tutorials.

Digital Surf was then represented at JASIS (Japan Analytical & Scientific Instruments Show) in Tokyo from September 5 to 7. Damien and Arnaud welcomed visitors to the booth for live demonstrations of Mountains⁸ software. They also presented the company's new visual identity to existing and new customers.

To finish this around-the-world trip, the Digital Surf team crossed the planet to attend the 19th International Microscopy Congress (IMC19) in Sydney, Australia from September 10 to 13. Cyrille, Anne and François B. were on hand to meet the scientific community working with microscopy and discuss their data analysis applications.



WHAT'S HOT ONLINE



SEEN ON THE WEB

NASA chooses Digital Surf's surface analysis software

French newspaper "Les Echos" reported on the announcement that NASA has chosen Mountains' software for a study on lunar micro-craters.

<http://bit.ly/2REirtu>



Have you visited our YouTube channel recently?

Check out our new video explaining the story behind our new visual identity!

<https://youtu.be/SvSSeWHHFw0>



SEEN ON FACEBOOK - JUL 24, 2018

Summer harvest from the eco-friendly Digital Surf veg garden

First summer harvest from our very own eco-friendly, inclusive veg garden located outside our Besançon office. This is tended to by a team of talented gardeners from the "Arapei du Doubs".

<http://bit.ly/2Qqihpp>



Surface Newsletter

Know a friend or colleague who would be interested in receiving the *Surface Newsletter*?

Let us know:

contact@digitalsurf.com

The newsletter is available for download on our website www.digitalsurf.com

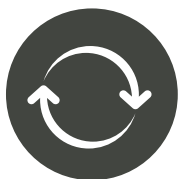
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LEARN SURFACE METROLOGY

Dive into our free online surface metrology guide and learn how to characterize surface texture in 2D and 3D

www.digitalsurf.com/guide



MEET DIGITAL SURF

Materials Research Society Fall Exhibit - Booth #716

Nov 27-29, 2018 - Hynes Convention Center, Boston, MA, USA

Nanotech - EU-Japan center for cooperation booth

Jan 29-Feb 1, 2019 - Big sight, Tokyo, Japan

DPG-Frühjahrstagung (DPG Spring Meeting) - Booth #98

Apr 2-4 2019 - Regensburg, Germany



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Surface Newsletter, November 2018

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