p:IGI+ release notes

This page archives the release notes sent with IGI's software releases. It might not be exactly what is sent to clients but it will give the team a chance to maintain a set of notes for each release.

3.1.0 (from 3.0.2)

Version 3.1 is an update from 3.0. It adds several new features, addresses some issues and updates the property model.

If you're updating from version 2.5 to version 3.1 please follow the how to guide here:

https://userguide.igiltd.com/software/pigi/how-to-guides/new-and-featured/how-to-migrate-a-pigi-v2-project-to-pigi-v3-0

It's important to update both Metis and p:IGI+ at roughly the same time, to enjoy all the new features in both products together. However, v3.1 of p:IGI+ is compatible with v3.0 of Metis (and vice versa).

New/Improved features (p:IGI+ and Metis Transform)

- Users can import LAS data (Project → Import LAS file…)
    - LAS v2 and 3 files are supported in both wrapped and unwrapped formats
    - both electronic (wireline and logging while drilling) and mudgas curves are supported
        - the import attempts to identify the borehole (exact string match only) or the user must select which borehole to add the curves to
        - the tool attempts to identify electronic versus mudgas logs automatically
        - the depth unit is automatically detected – if not in feet or metres the LAS file cannot be imported
        - the user can link properties – auto-linking is the default, but a user can override the selected links
            - links will not be made for tracks not recognised, with units that are not appropriate or where other curves have already been linked to that property
        - the user can save a linking template to store the associations
        - data are compressed to ensure compactness
    - information on which curves have been loaded for a borehole can be found in the borehole layer viewer/editor
        - log curves can be deleted from the borehole layer viewer/editor
    - curves can be plotted in the new borehole log plot
- A new Borehole Log Plot type has been added
    - the user can select either sample data, or log curve data to add to the tracks
    - as many tracks as wanted can be added
        - currently only supports one axis per track, but can show multiple sample and curve properties on each track as long as they are in the same unit group
    - relative track width can be defined

    - tracks can be reordered using drag and drop
    - within each track the curve colour can be set for log curves
    - within each track the point colour and style can be set of sample data
    - boreholes can be dragged and dropped onto the plot to show the information for that borehole
- We have added support for non-quantified values such as “nd”, “nil”, “<0.01”, “bdl” etc.
    - these can be imported and stored in p:IGI+ projects
    - non-quantified values can also be typed in pages
    - non-quantified values are shown in a purple font, and include in brackets the unit in which they were imported / typed
    - where both non-quantified and a numeric value are present the numeric value is also styled purple
        - numeric values are always displayed in preference to non-quantified values
        - deleting the numeric value reveals the non-quantified value
    - sample counts are shown at the top of the column –
        - the blue first value shows the total number of samples with a value including non-quantified values
        - the second purple number in brackets shows the number of samples with non-quantified values if any are present
    - non-quantified values are not currently shown on plots, or used in statistics
- A new Stiff plot type has been added to the available graphs, especially suited to showing water related properties (Ions)
    - up to 100 samples can be shown selecting a number of properties
        - most commonly the properties selected are anion – cation pairs from the Ions water analysis group
        - predefined auto-graphs are available for commonly used Stiff plots
            - users can select any properties they want for the left and right axes properties, for example extracted and unextracted variations in S1, S2 and S3
    - samples can be drawn on a grid layout of up to 10 by 10 plots, or overlain
        - axes are shown only for the top samples
            - axes layouts have been optimised to make best use of limited space
            - grid lines can be shown if desired
        - by default both axes start at zero, and join with a centre line shown
            - if axes do not both start at zero a small gap is left between the left and right axes to make this clear
            - log axes are possible
            - by default axes are symmetric, however asymmetric axes are possible
        - scale to data option is provided
        - on a grid layout data labels can be shown below each sample
    - colour palettes can be applied to set the colour
    - the shapes can be drawn as outline only, filled polygons only and filled polygons with black outlines

        - size palettes can be applied to set the outline thickness when drawn in outline only mode
    - the properties shown are described on a legend, with the text being editable
    - the ordering of the samples reflects the current sort order (natural project order if none set)
        - the colour palette sets the primary order if applied, with the samples then shown in sort order in each colour category
    - samples can be selected using brushing, respond to brushing and are highlighted when selected in visual query
    - sample sets can be applied, and the project sample filter is respected
        - counts of visible samples are shown – any samples not shown because the grid layout cannot accommodate them will be indicated
    - a right click option is provided to bulk edit the properties shown – they must all be in the same unit group, like a line plot, and there must be the same number on the left and right axes
    - bulk change can be used to update property analysis, indicator and units
    - zoom to data applies to visible samples only
    - Stiff plots can be copied
    - the default graph size can be set by the user and the default font style and size settings are used
- We have added a simple .hres chromatogram viewer which works in line with Metis. The viewer currently only supports the Shell **.hres** format
    - an indication of the availability of chromatogram files is given from visual query once sample are selected, with a view icon to open the file in the viewer
        - it is also possible to save the file to your local disk from here
    - If the file contains GCMS data, users can view any of the ion channels, individually or in combination
        - the colour and visibility of channels can be set and is shown in a legend
        - baselines will be shown if present
    - peaks can be labelled if identified, with a choice on how to select which peaks to label
    - x-axis (retention time) zoom is available to focus on specific regions of the chromatogram using the mouse
        - precise values of axes can be set in IU
    - chromatograms can be copied with and without a legend
    - The star plot artefact type has been replaced, merging it into the newly named:
        - **Line/Star Plots** with the option to wrap Line Plots (the star appearance) and
        - **Parallel Coord/Star Plots** with the option to wrap Parallel Coordinate Plots (the star appearance),

      giving more flexibility to users.
    - existing star plot autographs have been moved to wrapped line and parallel coordinate plots
    - star plots already in the project will be retained and can be viewed as before

        - user and company star plot autographs will be retained and can be created via the existing New Star plot route – IGI is happy to help convert these to wrapped line or parallel coordinate plots if desired
    - existing line and parallel coordinate plots can now be shown wrapped, or un-wrapped
        - when wrapped, an offset of the central point for the axes can be chosen
    - The wrapping action can be selected at plot creation or via the Graph Manager Axes tab
- Scatterplots can have their axes swapped easily, using a single press on the graph manager axes tab
    - Caution: Pre-existing artefact layers do not transpose correctly during the axis swap.
- Line plot pre-processing options have been extended to allow both normalisation (operations done on sample rows) and standardisation (zero mean, unit variance and scaling by the mean - operations done on property columns). This can be helpful to emphasise small differences between samples for production geochemistry
- The site/borehole editor has been improved:
    - The properties in the site/borehole editor can be set more easily
        - the user can select to save the currently defined properties to their user settings, meaning that these properties will always be the defaults shown in future projects
        - the user can choose to show all site/borehole properties with data (given the current project sample filter)
    - The user can apply a sample set to limit the sites / boreholes shown in the site / borehole editor
- Import of site and borehole data has been improved
    - the menu has been reworded to “Update site/borehole data…” to reflect a change to ensure this route is used to add information to existing boreholes and sites only
        - when using Transform we advise merging sites and boreholes before applying site and borehole metadata
    - it is possible to update only site data, only borehole data, or a mixture of both
    - when importing site and borehole metadata any site and borehole properties can be included
        - matching of sites is done on Name.Site, (Lat.Site, Long.Site), (X coord.Site, Y coord.Site), Location.Site
        - matching of boreholes is done on Name.Borehole, UWI.Borehole, Internal#.Borehole, IHS ID.Borehole
    - when importing trajectories and stratigraphy tops the files must have a Name.Borehole property, other borehole properties are optional
        - matching of boreholes is done on Name.Borehole, but can also use UWI.Borehole, Internal#.Borehole, or IHS ID.Borehole
            - Lat.Site, Long.Site can also be provided, but is not used in the matching
            - we do not recommend including Country.Site any longer
        - the old format can still be used, including .igi_well files
        - new, more flexible formats can be used

    - when a column header is not recognised, this is now reported specifically, giving the column header name
        - if a data row has a problem, the data row number in the Excel file is reported
- The borehole layer editor/viewer has been improved (available from right click on a borehole)
    - the borehole to view can be selected from a searchable drop down list
    - trajectory information can be viewed on each borehole
    - the list of borehole log curves can be viewed on each borehole
        - unwanted curves can be multi-selected and deleted (right click option)
- Users can convert a set of harmonisation choices to a rule set, allowing them to apply the harmonisation in other projects, writing the harmonised results to a new, or existing property
    - the rule set can also then be shared between users
        - Be aware that property values present, but not in the rule set will be lost from the project when the rule set is applied, unless first filtered out through a sample set that uses the entries in the rule set

Auto-Artefact Templates

		v3.1 Shipped	
Artefact File Ex	**Artefact Type**	**Count**	**Change**
IGI_PHT	Histogram	16	▲3
IGI_TPT	Triplots	24	▲1
IGI_XYT	Scatter Plot	98	▲2
IGI_DPT	Depth Plot	11	► 0
IGI_MDPT	Multi-depth Plot	11	► 0
IGI_STMDPT	Multiprop Depth Plot	8	▲2
IGI_LNT	Parallel Coordinate Plot	16	▲8
IGI_LPT	Line Plot	24	▲3
IGI_SPT	Star Plots	0	▼-10
IGI_CPT	Chung Plot	2	► 0
IGI_TST	Time-Series	4	► 0
IGI_DTS	Pages	32	► 0
IGI_MAP	Maps	16	► 0
IGI_PCP	Colour Palette	38	▲9
IGI_PSP	Shape Palette	3	▲2
IGI_PZP	Size Palette	8	▲4
IGI_RST	Rule Sets	3	► 0
IGI_TSB	Dashboards	25	▲2
IGI_ACT	Collections	3	► 0
	Total	342	26

- 26 new artefacts have been added in version 3.1 of the software.
- 2 new dashboards have been added, including the new Vitrinite Equivalence Maturity Board, which stacks 3 VR scaled histograms with VReq properties from the gasoline, saturate and aromatic fractions.

Machine learning features

Version 3.0 was the first release to enable the machine learning tools for all users, and these continue to be available in 3.1.

- A local runner has been provided for the machine learning tools, allowing users to host and run a particular version of the ML tools on the machine running p:IGI+
    - the local runner supports pure ML tool usage without p:IGI+ and integration with p:IGI+
    - it can also be used for offline working with the ML tools
    - it can be used where data security policy prevents sending of data over the web, even when this is fully secured
- When using PCA (and ICA) component loadings can also be shown on the projected data plots
- Unmixing has been extended to allow confidence to be set per end member, allowing better known end members to be more constrained
- An AI assistant has been added to the tools to support the user in the choice of models
    - the tool will provide summaries of the experiments attempted thus far, knowledge of what properties are being use and their statistics and guidance from out prompt to recommend what model experiments should be run
    - the user can see all the information sent to the AI to ensure no data is lost / full transparency
    - further details here: https://igiltd.com/news/introducing-the-ml-assistant
- The user can control the number of values that must be present in a sample before a prediction is made, meaning that predictions will typically only be made on samples with sufficiently low numbers of missing values. The user can control this at prediction time
    - Novelty scores are now only returned where a machine learning prediction is made – previously this was all samples, but the risk is missing value replacement takes everything close the data, resulting in unrealistically low novelty scores
- Brushing has been improved across the ML tool with support in all useful plots, including unmixing, regression, classification and clustering
    - brushing works to – and from – the spatial interpolation tool
    - brushing can be used to define the end members in the unmixing tool
    - brushing in the ML tool respects the current p:IGI+ brushing colour
- A release history information button has been added to the ML tool, making these notes redundant: https://ml.igiltd.com/?release_history
- The ML UI has been improved with better response to resizing and usability improvements

Metis features

- Stratigraphic tops can be uploaded with sample information from Transform and are stored (and used to calculate sample level stratigraphy) on Metis
- Compatibility of p:IGI+ and Metis instance is shown more completely when connecting to a Metis instance from pIGI+
- Discover now retains changes to a property set on export.
- The configure properties button is now only visible on the Samples tab in Discover

Property model

- A new Logs group has been added to support the import of wireline curve data into p:IGI+ boreholes from LAS 2.0 files. The group consists of 21 properties which represent the core curve properties captured/reported by routine wireline tools. The properties include 2 TOC values which can be calculated. We've made provision for a curve calculated following Passey's OM method and a curve derived from an undefined ML algorithm method.
- In the Physical group the previously named **Rock dens.Phys** which captured the *dry bulk rock density* has been renamed to **Dry dens.Phys** to clearly distinguish it from the newly added **Wet dens.Phys** property.
- The ability to store Vitrinite reflectance equivalence values from T-max on extracted samples (**Re T-max-Extr**) has been added to the MatCalc group alongside a property to record the method used to derive it (**Re T-max-Extr orig**)
- **T-max S2a** has been added for the Pyrol6, Pyrol7S and PyrolHawk (including the Extr variants) groups. This is relevant when the analysis mode is set to "reservoir".
- **RC** and **PC** (Residual and Pyrolysable organic Carbon) properties (previously available in Pyrol6) have now been added to the PyrolHawk and PyrolHawk-Extr groups.
- Improved Alias across numerous properties to assist with search and linking.
- 11 Additional properties added to the PVT-GC group in line with APT's latest version of their APvT 3.2 output file. Properties are predominantly gas ratios e.g. (**C3/C5, C1/C4(n)**), and 3 GOR properties from the Wright, A.C. (1996) Estimation of gas-oil ratios (GOR) and detection of unusual formation fluids from mud logging gas data. SPWLA, 37th Symposium. Note: the equations are not included in the property and therefore are required to be calculated externally.
- Oil and gas compressibility (**compress pReserv** & **Z-factor pReserv** respectively) have been added for reservoir pressure (not only the previous saturation pressure).
- A series of C14–C30 mid-chain branched monomethyl alkanes (at the 12 / 13 position) have been introduced to both the Sat-GCMS and WO-GMCS property groups. These have historically been named 'X-peaks' in the literature.
- Our previously named Gasol-GC group has been renamed to UHR-GC (Ultra-High Resolution) to better accommodate reported GeoMark data. To this newly named group we've added additional gasoline properties and a series of retention-time-defined internal GeoMark peaks (e.g. PC7AA = **GM-C7 AA.UHR-GC**)
- The **Field** property has been added to the .Site property group. This now sees a Field property in both the Site and Borehole groups so users can populate as needed.
- The description and alias list of the **MAS21+22/Tot** and **TAS 20+21/Tot.Arom-GC, .WO-GCMS, .GCMS-MS and .MRM-GCMS** properties have been updated to recognise the naming used in Peter's et al. 2005 biomarker guide where they refer to the included properties as being assigned to groups
- Responding to a request from Geolog, we have added 16 positively charged ions (predominately associated with the Rare Earth elements – Lanthanides) e.g. (Dy 3+, Sm3+, Si 4+) and 8 ion ratio properties e.g (Ca/Mg, SO4/Cl, Ca+Mg/HCO3+CO3).

- Responding to a request from Geolog, we have added a series of properties to the MudGas and MudGas-Corr groups to enable data reported from Geolog's **G8 analysis** to be stored**.** This is an advanced mud gas logging service that extends real-time hydrocarbon measurement up to the heavier nC_8 components (including aromatics, heptanes, and octanes). Note: As the data comprises continuous readings, data will be imported from LAS files as curves, stored against a given borehole.
- A new **MXor.Pol-GCMS** property has been added to the property model. This property sees 1- + 4-Methylxanthone peaks ratioed relative to the 2- + 3-Methylxanthone peaks from m/z 210. Clarity has been brought to the model with regard the concentration of dissolved silicon (**Si 4+** added to the ion group and used in charge balance equations) and dissolved silica (**SiO4 (eq)** added to the water group and representing reactive dissolved silica).
- Two salinity properties have been added to the Water group. **PSU** – practical salinity units for when salinity is derived from a conductivity measurement and **eq NaCl** – equivalent salinity expressed as sodium chloride.

Fixes

- We have update the software to use .Net and resolves a number of vulnerabilities across the board.
- Pasting rows in the site/borehole editor did not respect empty rows – it does now
- Entering dates in the site/borehole editor would not respect daylight savings and thus store the date an hour off in day light saving dates
- Project merge was showing incorrect units for the resulting merged samples – the data was always fine, now the view is correct too
- When sending data to Metis, from Transform, sites without names are now sent to Metis to be considered for merging with existing sites on Metis (typically using Lat, Long)
- When creating artefacts, pressing return will now create the artefact and close the create dialogue
- String predictions from ML models report the correct value counts on pages (no longer count 'nulls')
- Transform Online can harmonise multiple string values at once correctly
- Site properties can be harmonised on Metis using Transform Online
- Line plots can have their properties changed even if the molecular indicator is not the default
- Sample selection outline is removed when visual query is closed
- Sample counts on pages correctly respond to filtering based on the application of colour palettes
- Normalisation / pre-processing is always shown on line plots when opened for the first time in a project session
- Visual query highlight always shows on a page, even if visual query was open before the page was opened
- The naming of new site and borehole sample sets has been simplified to respect the naming as shown in the site and borehole manager

- Sorting in the site/borehole editor uses the natural sort order
    - this also applies to the site list in the sample reassign
- Fixed an issue where the selected Metis service was not shown correctly when changing the selection to a new Metis environment
- Fixed an issue preventing Discover failing to load specific zipped .shp files.
- In Transform Online sites without boreholes can no longer be expanded in the Sites & borehole view.
- In Discover querying using the API° unit was returning incorrect results.

Larger numbers of samples can now be uploaded to Metis via Transform successfully.

Known issues

- From version 2.5 onwards p:IGI+ will no longer open version 1.x projects. Older projects should be converted to version 2.0 or later before updating to 2.5 or later. IGI will be able to provide a tool or a service to update old projects if needed.
    - p:IGI+ version 3.0 will migrate projects to the new .pigi3 format – these will not be able to be opened in p:IGI+ 2.x
- The "Sitka" font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows
- Following the addition of the Pyrol7S and Pyrol7S-Extr property groups the associated TOC properties have not been added to the TOC.Any, TOC_Bulk.Any and TOC_Extr.Any properties.

Installation issues

Requires .NET framework version 10.0

3.0.1 (from 2.5.0)

Version 3 is a large update. We have increased the major version number as there is a significant change to the way the tools work with sites and boreholes (previously wells), which means that version 3.x of p:IGI+ will not be compatible with version 2.x of p:IGI+ or Metis. This is an important consideration meaning we will need to update both Metis and p:IGI+ at roughly the same time. We will be supporting clients using Metis for this update. We are also producing 'How-to guides' on the updated online user guide, to explain how to optimally update your v2.5 projects – see here: https://userguide.igiltd.com/software.

New/Improved features (p:IGI+ and Metis Transform)

- The concept of sites and boreholes (previously wells and non-wells) has been introduced to p:IGI+ and Metis
    - a site is a location shared by one or more samples
    - a borehole belongs to a site and represents a drilled shaft into the ground. It can be a common source of one or more samples. A site can have multiple boreholes associated with it.
    - Sites are merged by default on import to p:IGI+ based on (latitude, longitude), (or x, y coordinates), site name and location.

        - Transform will not merge sites automatically, this being done manually in the project merge and/or site/borehole merge
    - In p:IGI+ boreholes (which replace wells) are merged by default on import using the site, and the Borehole Name, UWI or Internal#.
        - Transform will not merge boreholes, this being done manually in the project merge
    - site properties can be harmonised, as can borehole properties (with the exception of the borehole name).
    - a new sites and boreholes manager sits below the artefact manager and shows the sites and boreholes in a project
        - this tree can be independently searched to find the sites and boreholes you want with the ability to show only sites, only boreholes or both
        - only when you apply a site or borehole to a visual artefact, like a graph, map or page is a site or borehole special 'static' sample set artefact created grouping those samples that are part of that site or borehole
            - when converting projects from v2.5 a set of borehole sample set artefacts will be created automatically
        - the site/borehole manager can be resized as desired to use as much or little vertical space as needed
        - the sites and boreholes respect the project sample filter, and will only be shown if at least one sample from them is included in the sample set applied
    - samples can be assigned to boreholes or sites from a right click on pages
        - a sample assigned to a borehole is automatically 'assigned' to the associated site
    - a dedicated site and borehole editor has been created, available from the edit icon in the top right of the site and borehole manager
        - only one instance of the site and borehole editor can be opened at a time
        - the site and borehole editor can be configured to show any combination of site and borehole properties from a right click option on the headers
            - the layout is similar to a page, but in this case a row represents a site, or a site and its borehole
                - where a site has multiple boreholes the site data is repeated – editing one value updates all
            - columns can be frozen to the left, and unfrozen (similar to key columns, but only applies to the site/borehole editor)
            - users can sort on a selected column or revert to the default sort which is by Name.Site then Name.Borehole using a natural sort order
            - units of measure and display precision can be customised by the user and are remembered in the settings
            - counts are provided for each column – these represent the number of sites / boreholes with data
                - for sites this does not count 'duplicated' values across multiple boreholes at the same site

                - the harmonise option is available from right click on the column header
                - property help is available from right click on the column header
                - an individual property can be removed from the editor using a right click on the column header
            - all data can be edited in the page
            - copy will copy what is shown in the view
            - paste can be used for cells, or blocks – care must be taken to ensure the correct cells are being targeted
                - validation prevents pasting of incompatible values (e.g. strings in numeric properties) and errors are highlighted to the user, however any valid values will be stored
                - pasting a single value into a range will fill that range with the value
                - when pasting different values for the same site (where this has multiple boreholes, so appears multiple times) the final value is retained
                - undo/redo is possible using Ctrl+Z / Y or the Edit menu items
                - the Delete key clears the selected cells / values
            - you can create new sites and boreholes from a right click on the grid of the site and borehole editor
                - this can also be accessed from the Data menu
            - you can brush (and unbrush) sites and boreholes from the editor using the right click option – this selects (or deselects) all samples associated with the site / borehole
                - any site or borehole with at least one sample brushed will show as being brushed using the brushing colour in the row headers
- Merge has been dramatically improved, allowing the user to explore more complex merges with feedback
    - merge now works in detail and respects the project sample filter – it is important that in large projects over 5,000 samples you merge in chunks to ensure performance remains acceptable
    - project merge now works over 3 stages: site merge, borehole merge and sample merge
        - sample merge can be run independently, skipping the site and borehole merge stages
        - site merge can be run independently to only merge sites
    - merge provides a detailed summary breakdown of the issues found when trying to bring together multiple rows of data
    - all data can be reviewed prior to merging, or the user can select to focus on only conflicts, or samples with missing merge criteria
    - the user can manually resolve merge conflicts
        - options are provided to automatically resolve conflicts due to precision differences, time difference and to prefer the most common value
            - these should be used with care as they can change data

        - the user can select to create samples sets and pages – merge diagnostics – to explore the merge on pages
    - the user can select a sample set to restrict the merge to a subset of data, and merge respects the project sample filter as mentioned above (to reiterate we encourage users to chunk the merge in large projects over 5000 samples)
    - it is now possible to merge samples not assigned to boreholes and sites with the samples which are assigned to boreholes or sites
        - this means **if you have good merge criteria**, for example unique sample names, you can import new analysis data for existing samples without having to attached borehole information and still merge with existing samples assigned to boreholes
- Collocation has been updated to include sites, meaning only samples at the same site or borehole will be considered as candidates for collocation
- Artefacts such as sample sets and palettes applied to other artefacts can now be removed from the top toolbar using a right click on the icon and selecting Remove
- Histograms can now be shown as stacked, overlain (most effective with transparency) or side by side to allow improved comparison of different populations
- Pages are more flexible
    - sort is now based on natural sort order so numbers in text properties are more naturally sorted, which is especially useful when sorting on borehole names for example
    - a palette can be applied to a page – this will colour the row headers using the palette colour, add a key to the bottom of the page window and allow you to filter samples using the palette
- Open artefacts are closed if the user selects to dock them in the workspace
- You can create the complement of a static sample set – that is a static sample set of all samples except the ones selected / in the static sample set
    - this can be done from the creation dialogue (without creating the sample set from the selected samples)
    - or from a right click menu on an existing static sample set
- The property selector, used across the system, will try and retain the indicators, units and ratios when a property is changed, rather than resetting these to the default
- A data QC tool has been added to run after import to populate missing data in a project, such as missing datums, site names or location information
    - the tool includes some basic QC rules including optionally creating sample sets for any samples where the top depth is below the base depth, samples that are below the associated borehole terminating depth and samples that report a depth but are not assigned to a borehole
    - the user can define their default preferences for the QC rules applied on running
    - this tool can be run on demand from the Data menu as well as after import, which can address issues caused when a user pastes data into a project, for example setting the depth datums so depth plots work as expected
- Time series plot axis labelling is more compact and natural

- Maps can have grids added in a range of formats (GeoTiff, NetCDF, ASCII grid, ESRI grid, ZMAP, Surfer .grd and Geopackage)
    - the grids must include projection information and will be reprojected into web Mercator for display on the maps
    - the user can select a continuous colour bar for the grid and define the range of that colour bar, which is shown nicely on the map legend
- Data from maps can be exported to shapefiles which creates a point layer as shown on the map
    - for numeric properties all statistics (mean, median, std dev, etc) from colour and size palettes are added to the associated database file
    - for discrete (text) properties, counts of each value are added to points in the associated database file, which can be used in e.g. QGIS or ArcGIS to create piecharts as p:IGI+ does
- A Geospatial data tool has been added to the Map menu to allow users to convert (X, Y) coordinates to (Lat, Long) coordinates
    - this will use the projections specified for each sample where they are valid, but will require additional information from the user where they are not set
        - this allows the user to convert from most widely supported local spatial reference systems
            - users can search for a projection using an epsg code where know this, or using descriptive text
    - this tool can be applied to a subset of the project using sample sets

Machine learning features

Version 3.0 is the first release to enable the machine learning tools for all users. A basic version will be available to all users which supports the functionality to undertake: outlier detection, dimension reduction using PCA, k-means and hierarchical clustering, linear regression and logistic (linear) classification modelling, and spatial interpolation on maps using inverse distance methods.

Advanced methods are available to all machine learning partners including soft cluster, various advanced regression and classification methods (neural networks, support vector machines, random forests, gradient boosting methods and probabilistic Gaussian process methods), improved spatial interpolation options including Kriging like methods (Gaussian processes), and a novel Bayesian unmixing tool which can be used for production allocation and general challenges around unmixing of mixed signals. All users have the option to subscribe to the advanced ML tools if they wish.

- A Bayesian unmixing tool has been developed
    - users can select the data set (samples and properties) they wish to consider for unmixing using a page and sample set
        - current system targets the use of concentration measurements (must be positive, with assumed log-Normal proportional error distribution) and unconstrained properties (can be negative and positive, with assumed Normal or Gaussian error distribution)
        - users can define the errors on the properties

    - users can provide end members, or use the automatic Vertex Component Analysis (VCA) methods to identify candidate end members
        - brushing can be used from the project to define the end members
    - users can specify their confidence (their prior in a Bayesian setting) over the end members, either individually or for all end members
    - the algorithm finds the maximum aposteriori probability end members and mixing weights using a novel algorithm inspired by alternating least squares methods
        - mixing weights (proportions) are returned to p:IGI+ for each sample sent
        - the identified end members can be exported to an Excel file (with the mixing weights and other model information) – these can be imported back into p:IGI+ if needed
    - full interactivity is provided including univariate outlier removal, missing data treatment, and model initialisation
- Spatial interpolation has been added as a right click option on the map
    - will interpolate the continuous valued property selected based on the colour palette by default
        - use a sample set to limit, e.g. to a given formation
    - provides the option to transform the interpolation target based on it distribution – option for log and square-root transformations are especially useful for positive properties
    - user can add a grid to provide additional information, e.g. a depth grid or other ancillary information
        - this is used with spatial location to improve the interpolation
    - simple inverse distance method provided as a baseline, but full tool include trend surface analysis, spline and Gaussian process (Kriging / geostatistical) models
    - diagnostics are provided on the quality of the interpolation, similar to regression models
    - tool provides control over the prediction grid size and how far to extrapolate beyond the observations
    - grid can be saved as a geotiff format which can easily be applied (using drag and drop) to any map in p:IGI+, but can also be imported to all GIS systems
- A semi-automated machine learning model selection option has been added allowing you to explore a range of model choices quickly and easily
    - the user can select a model of their choice from the trained options, with the ‘best preforming’ automatically suggested
    - we have added a ‘gridsearch’ engine to make this process fast for the user, by spinning up enhanced compute capability
- Novelty detection has been added to the ML pipeline providing the user information about how different the data on which the model was trained is from the data being used in predictions
    - this will help alert users to the case of the model being over-confident on data it has not seen before – a novelty score is returned which can be shown alongside the predictions

- The machine learning tool window is no longer modal, meaning you can still interact with p:IGI+, for example to explore specific samples in greater detail, while training the ML models
    - this means we have been able to add support from brushing to and from the ML tools, with almost immediate synchronization with p:IGI+
    - we have implemented support for brushing in almost all the ML tools including in the 3D and 2D plots and regression diagnostics, although support will be further improved in maps (spatial interpolation) moving forward
- ML model predictions can be used as inputs to project properties, although care should still be taken when doing this to avoid chains of inputs, or issues if a model is renamed
- The display of many of the diagnostic plots has been moved to the front end (making them more interactive)
    - the ROC plot now allows you to vary the decision threshold to help understand the meaning of the curves
- Outlier detection uses a robust scaler to minimise the challenge of working with data which contains extreme values
    - we also provide the option to use elliptic envelope outlier detection as well as the isolation forest option
- Value outliers that represent potentially erroneous data can be discovered at the tool startup to remove their effects from further exploration
    - the user is presented with a default sensitivity and preview dot-plots which enables them to tune the value outlier sensitivity choice
    - the user is provided with the option to set a per property sensitivity if wanted
    - value outliers are removed from the data and treated as missing values
- We have improved the retraining of models, although this does result in a slightly longer time to save the model to p:IGI+
    - the retraining now first provides a view onto the trained model, then allows the user to start from identical settings and being to explore changing those and training again
- The “Find a good data set” tool has been improved to make it easier to provide precise values for the sliders supporting easier reproducibility

Metis features

- The concept of sites has been introduced to Metis
    - a site is a location shared by one or more samples
    - sites have their name populated according to the common-prefix of their associated borehole names
    - we have added a sites tab to Metis Discover and Transform Online
    - sites and boreholes can have their metadata updated in Transform Online in the newly added site manager
    - sites and boreholes can be deleted from within site manager
        - Deleting all the boreholes and/or samples will also delete the associated site
    - in Transform, uploading data to staging has an additional site stage where matching sites in Metis are identified and conflicts can be resolved

- Stratigraphy (tops and trajectories) can now be bulked uploaded via Transform Online
    - using a excel template chronostrat and/or lithostrat can be uploaded to multiple boreholes and assigned to either primary or alternative stratigraphy
    - differences in the uploaded stratigraphy are reported and a data manager can choose to update when
    - stratigraphy is then assigned to samples accordingly
    - a borehole's stratigraphy can be viewed in the site manager
    - stratigraphy is downloaded from Metis into p:IGI+ when linking data
    - stratigraphy from Metis can also be updated within p:IGI+ separately
- p:IGI+ v3.0 can link and download data from Metis v3.0 (and above). However, Metis v3.0 is not compatible with earlier versions of p:IGI+
- The Metis tab in the settings menu has been improved:
    - expired sessions are detected so only Metis environments where login details are still valid are shown
    - environments can now be removed from the Metis settings dialogue in p:IGI+ and Transform

Property model

- To accompany the introduction of a new approach to handling location information (see new and improved features section above where wells & non-wells have been replaced with sites & boreholes), the following edits and additions to the property model have been made:
    - the previous **.Well** property group has been renamed to **.Site** and a **.Borehole** group has been added.
        - The site group contains details on the site name/description, site position and site geographic/geologic location, absolute datum and site elevation/depths
        - boreholes contain details on the borehole name/description, drilling information, bottomhole information and depth datums of the borehole
    - the existing **.Sample** property group remains, but the geographic properties for the previous "non-well locations" have been removed, with data merged into appropriate **.Site** group properties
        - two properties, Location.Sample, and Campaign.Sample remain that can be used at the sample level, but we advise using the **Location.Site**, and **Campaign.Site** properties, as Metis only supports the site variants. This is especially important in Metis Transform
    - An automatic migration of existing project well/non-well location/metadata will take place when version 2 files are opened in V3.0. It is advised that users should run a site-level merge and the Data QC tool to ensure correct site groupings and link creation between sites and boreholes.

- The (**Visk-RL**) group has been reviewed, and work completed to incorporate new maceral properties and aliases. This will assist with linking during import and will see more data being stored.
    - Exsudatinite (**Exsu**) has been added to the Liptinite scheme, and the hierarchy equations have been updated accordingly.
    - Gelinite (**Gel**) and Corpogelinite (**Corp-gel**) have both been added to the Vitrinite scheme and the hierarchy equations updated accordingly.
    - Secretinite (**Sec**) has been added to the Inertinite scheme, and the hierarchy equations have been updated accordingly.
    - Sclerotinite (**Scl**) has been renamed to Funginite (**Fung**) to match the more commonly used term for fungal remains.
        - *Sclerotinite was previously used to describe both fungal remains and certain oxidised plant secretions; the term is now obsolete, with these components now classified as funginite (fungal remains) and secretinite (oxidised plant secretions), (O'Keefe et al., 2013).*
- Discussions with clients and analytical vendors have led to improvements in the **Py-GC** and **Py-GC-Extr** property groups.
    - descriptions updated for the total resolved fraction properties to indicate that the input values to the existing Primary (APT used) Py-GC scheme (C1, C2-5, C6-14, C15+, GasFract, OilFract, GOGI) should be inclusive of the UCM.
    - a new set of total resolved fraction properties has been added to allow the loading of data exclusive of the UCM have been added (C1xUCM, C2-5xUCM, C6-14xUCM, C15+xUCM, GasFractxUCM, OilFractxUCM, GOGIxUCM).
    - in order to appropriately create and plot data on the 1989 Horsfield chain-length distribution ternary plot, the C6-C14 and C15+ properties require only the n-alkanes and n-alk-1-enes. Consequently, two new properties with a sum equation have been added to create appropriate axis properties: AlkSumC6-14 and AlkSumC15+
    - sample weight (Sam wt) added to the **Py-GC** and **Py-GC-Extr** groups
    - updated Geochem help descriptions for the Py-GC and Py-GC-Extr properties to reference them to the pyrolysis production gas chromatography analytical method that is run
- Across all **Gas** and **MudGas** groups, we have edited the following gas ratio properties to ensure the presence of an [*]any indicator, appropriate target units, ratio format, etc.
    - He/Ne
    - C1/N2
- New **Gas-Iso** ratios have been added to the property model:
    - d13C nC4-iC4
    - d13C C1-C2
    - d13C C1-C3
- A series of short-chain A-ring methylated steroidal hydrocarbons from the m/z 231 and m/z 245 have been added to the **Sat-GCMS** and **Arom-GCMS** group. Along with the property ratios, properties with associated equations have been added to plot age-determining plots published in Killops et al. (2023)
- The Terrigenous-Aquatic Ratio (TAR), (nC27 + nC29 + nC31) / (nC15 + nC17 + nC19), has been added to the **Sat-GC**, **WO-GC**, **HT-GC** and **TE-GC**

- A series of VR maturity equivalence properties have been added to the property model
    - %R(iC4/nC4) – taken from Arouri, (2024)
    - %R(iC5/nC5) – taken from Arouri, (2024)
    - %R(Ts/Tm) NO – taken from a published report from DISKOS
    - %R(Ts/Tm) Bennett – taken from Bennett & Larter, Geoconvention, Calgary, Canada (2019)
- The parameters Methlycyclohexane Index (MCyC6Index), Cyclohexane index (CyC6Index) and Sum dimethylcyclopentane (SumDMCyC5) have been added to the **Gasol-GC**, **TE-GC**, **WO-GC**, **WO-GCMS**, **MudGas**, **MudGas-Corr**, to assist in identifying the source origin of thermogenic gas. The sum of the dimethylcyclopentane property enables the source-based triangular plot from Huang et al., 2025, to be created
- A series of existing GCMS saturate ratios have been created in the **GCMS-MS** and **MRM-GCMS** groups
    - H33 22S/R , H34 22S/R, H35 22S/R
    - H30ab/H29ab
    - Dia29/St29aa
- Ratios have been added to a range of **WO-GCMS**, **Sat-GCMS**, **Arom-GCMS**, **Diam-GCMS**, **GCMS-MS**, **MRM-GCMS** properties. The majority of properties were methylated diamonoids
- New property groups were created to accommodate the loading and storage of Rock-Eval 7/7S **(Pyol7S** & **Pyrol7S-Extr**), both pre- and post-extract. The majority of the properties were duplicated from the Pyol6 and Pyrol6-Extr groups as the same core functionality is present across both machines. The additional capabilities of the Rock-Eval-7S is when it is used to measure and determine the presence of organic, mineral and total sulfur in rock, kerogen, coal, shale, oil (reservoir) samples. New properties, Sum properties and Ratio properties, have been created for the peaks derived from the SO2 detector measuring sulfur products formed during the pyrolysis and oxidation cycles
    - the TOC.Any properties will be updated to include RE7 TOC in the following release
- Lithium, Ferrous Iron and Ferric Iron elements have been added to both the **XRF** and **Inorg** groups. The ratio Zr/10 will also be added to both groups to enable elemental provenance and palaeotectonic setting triplots to be created
- Properties associated with water samples have seen several additions and edits.
    - A range of commonly reported BTEX and Organic acids have been added to the **Ions** group
    - New unit conversions between mol/vol, wt/vol, and meq/vol have been added for the **Ions** group properties
        - With meq/vol units present, then standard hydrology plots will become possible to create / display data
    - Property descriptions for Ions group properties have been updated to specify the ion charge to ensure users are aware of what data is correct to link to ensure the new unit conversions are accurate
- A full review and update of the Geochem Help information and property code lists/alias lists linked to the new/edited property groups has been completed

Fixes

- When changing the search term in the property selector we now always return to the top entry to ensure the user sees the most relevant suggestions
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To address this save the project, close p:IGI+, restart, and open the project. We have fixed this issue with the upgrade to support the latest .NET version
- Occasionally when resizing graph windows the data view can pan unexpectedly. This is a rare event, but has now been fixed
- When a user loses connection to the licence server p:IGI+ will now behave more gracefully, allowing the user to save their work and exit
- Fixed a potential security vulnerability in auto-artefacts
- Dates prior to 31st December 1899 are now exported correctly, addressing an Excel limitation
- Cloning a statistics artefact will now produce an identical copy of the original artefact
- Sample counts on the top of pages are now correct for project properties with the [*] any indicator
- Editing a project property equation used to not update properly when adding a new exists{} clause – this has been fixed
- Property help will now correctly jump to provide help on a property selected from a page even if the property help is already open
- Addressed some issues when creating and editing overlay / underlay objects in the overlay editor.

Known issues

- From version 2.5 onwards p:IGI+ will no longer open version 1.x projects. Older projects should be converted to version 2.0 or later before updating to 2.5 or later. IGI will be able to provide a tool or a service to update old projects if needed.
    - p:IGI+ version 3.0 will migrate projects to the new .pigi3 format – these will not be able to be opened in p:IGI+ 2.x
- The “Sitka” font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows
- The Excel import template for site/borehole data (Project --> Import site/borehole data...) only allows the import of metadata when a valid borehole name is present (Name.Borehole). The import of site only metadata is currently not possible.
- Following the addition of the Pyrol7S and Pyrol7S-Extr property groups the associated TOC properties have not been added to the TOC.Any, TOC_Bulk.Any and TOC_Extr.Any properties.

Installation issues

Requires .NET framework version 8.0

2.5.0 (from 2.3.0)

Version 2.5 is the version shown at the 2024 user group. Version 2.4 was an internal release only. In version 2.5 we have added significant functionality designed to support a range of workflows and increase their efficiency.

New/Improved features (p:IGI+ and Metis Transform)

- We have introduced the concept of a 'dashboard', allowing the user to create complex arrangements of graphs, maps and bar charts / box and whisker plots.
    - users can add selected (graph, map and statistics) artefacts to dashboards
        - artefacts on dashboards are fully interactive to brushing, pan zoom etc
        - palettes and sample sets can be applied to individual artefacts when they are on a dashboard
        - artefacts are locked in the artefact tree once applied to a dashboard (but can easily be removed from the dashboard
    - palettes and graphs can be applied to all entities on a dashboard by being dropped onto the 'Drop zone' on the dashboard toolbar
        - using the "Apply to all open artefacts" right click option on palettes and sample sets will apply to all open dashboards and all artefacts on them
    - dashboards can be configured to have a maximum of 4 by 4 panels, and can be laid out using the dashboard editor
        - at creation the user can select the default configuration
        - the dashboard editor allows the user to define the partition of the dashboard space to cater for non-regular dashboards
    - dashboards can have artefact information added and saved as templates
        - auto-dashboards are supported and will list the artefacts applied to them in the preview
        - users will be able to add their own, and company auto-artefacts
    - dashboards can be docked in the p:IGI+ workspace providing an option of using that effectively
    - dashboards can be copied as a whole from the dashboard toolbar
    - the default dashboard size can be set in the Dashboards settings section from the main settings menu
    - underlays and overlays can be edited in place is dashboards, although we do not recommend doing this due to the limited space available
- A first version of the collocation tool has been built
    - the default grouping is based on the sample (row) being from the same well, at the same depth, or at the same location (lat,long or x,y)
        - the user can select to include sampling time as a grouping option, but this is excluded by default as often samples will not record sampling time
        - the user can set a tolerance on the matching for all numeric properties
        - strings must match exactly (case insensitive)
    - users can select the mechanism by which samples are grouped together choosing up to three user criteria
        - depth can be included as a fourth criteria if desired

        - samples without the user criteria will attempt to group using the location, depth and optionally time criteria
    - users can preview the groups before deciding on whether to create the collocated samples
    - for samples that collocate and have conflicting values the collocated sample created from the group is assigned the mean value, and the standard deviation is written to the corresponding uncertainty value
        - for long strings all the values are concatenated (chained together)
        - for short strings all the values are concatenated (chained together) and if necessary the string is truncated
    - if the user selects to create the collocated samples, these are automatically added to the project as new samples (which p:IGI+ knows are collocated)
        - static sample sets are created for the collocated samples + the unique samples, just for the collocated samples, just for the unique samples and also for those samples which were grouped and contributed to the collocated samples
            - these sample sets can be used as any other, including in the project sample filter
    - the collocations are remembered in the project on save and will be present if another user opens the project
        - the user can open the collocation manager at any point to review the collocation criteria used, and explore the samples that were grouped
    - the collocation can be cleared at any time, returning the project to its original state, removing the collocated samples and the associated sample sets
    - a visual indicator is provided in the toolbar showing that a collocation is active
        - if a sample contributing to a collocation is edited the user is informed that the collocation is out of date
- Bar charts have been added to allow the graphical display of contingency tables, showing the relationship between the number of samples in two properties (multi-variate frequency distribution)
    - the original contingency table has now been removed
    - colour and shape palettes are used to define the two groupings, so both discrete and binned continuous properties can be used
        - interaction with palette show/hide entries provides flexible control over classes / bins shown
    - sample sets can be applied to filter the data
    - a data summary can be added either above, to the right or below to enable flexible use in dashboards
    - the y-axis maximum can be configured if desired to provide comparisons
        - user can show counts or percentages on the y-axis
        - horizontal grid lines can be shown / hidden
    - a tabular view can be selected in the artefact, or on a dashboard
        - table styling can be controlled and remembered
    - the chart can be copied as an image, with or without the legends
        - the legends can be copied individually

        - if the tabular view is copied, a text table is put on the clipboard
- Box and whisker charts have been added to allow the graphical display of pivot tables, showing the relationship between a continuous property and the samples in up to two discrete properties
    - the original pivot table has now been removed
    - colour and shape palettes are used to define the two groupings, so both discrete and binned continuous properties can be used
        - interaction with palette show/hide entries provides flexible control over classes / bins shown
    - sample sets can be applied to filter the data
    - it is possible to show just the box and whisker element, just the points or both
        - a distribution curve can also be shown
    - the box and whisker element is based on robust statistics (median centre line, top and base of box at 75^{th} and 25^{th} percentile, whiskers to 1.5 times the interquartile range, above and below)
        - optional you can show the mean centre line, the box to show the standard error of the mean, and the whiskers to show plus / minus the standard deviation of the data
    - a data summary can be added either above, to the right or below to enable flexible use in dashboards
    - the y-axis minimum and maximum can be configured if desired to enable comparisons
        - user can select to show in log or linear axes
        - horizontal grid lines can be shown / hidden
    - a tabular view can be selected in the artefact, or on a dashboard
        - table styling can be controlled and remembered, including the display precision
        - users can show the mean, or the mean +/- the standard deviation in the tabular view
    - the chart can be copied as an image, with or without the legends
        - the legends can be copied individually
        - if the tabular view is copied, a text table is put on the clipboard
- The statistics artefact has been updated to allow it to be applied to dashboards
    - the presentation of the statistics view has been cleaned up
    - the user can select to transpose (swap row-columns) statistics to show summary information efficiently on dashboards
    - controls have been moved the right click options to clean up the presentation of key information
    - the filter summary is used to show if any sample sets are applied
- We have added a list of up to 20 recently used projects in the Project → Open recent → menu
- Working on files stored on remote drives should be more stable and performant
    - users can configure the location for their working files and backup files when using p:IGI+

        - ideally the working folder and backup folder should be on a local drive with fast access times
    - p:IGI+ will no longer create large lock files, rather a small lock file will be write to the location of the project file being opened
        - the user will be given the option to ignore the lock file and open the project anyway, meaning no more copy of copy of copy …
        - backup files will be created to allow for easier recovery, with the backup location being specified by the user
- Menu's have been reorganised to better reflect workflows, splitting the statistics and model menus
- Settings have all been moved to a common Settings menu to allow you to easily find all application / user settings
    - the location of the default project is now a setting, so this could be placed centrally and shared across a company
    - the Metis connections are managed in the settings, and have been updated to provide clearer guidance on connection issues
    - the table colour and chart sizes for contingency and box and whisker charts can be defined
- Shape palettes autofill order provides more distinct shapes, moving the triangles to the last position in the solid shapes
- Sorting in palettes uses a natural sort order that works for well names and text properties
- A project sample filter has been added – this restricts all interactions in p:IGI+ to the selected static or dynamic sample set, so you effectively work only on a subset of your project data
    - both dynamic and static sample sets can be assigned as the project sample filter using a right click from the artefact
    - the filtering applies to all operations in the project (what is shown on graphs, maps, palettes, pages, statistics, merge, harmonise, collocate, PCA, clustering, properties with data, find a data set and export). The only aspect not affected is saving the project, where all data is always saved, alongside any project sample filter
        - also applies to project merge in Transform, and upload to staging
    - the project sample filter can be combined with other sample sets and always uses the AND (intersection) operation
        - this allows you to combine static and dynamic sample sets
    - you can remove the project sample filter at any time
    - all artefacts show a visual indication that a project sample filter is applied
        - the filter summary will show the project sample filter name if applied
    - application can be done or undone at any time
    - counts shown on the information summary on graphs, maps and statistics respect the project sample filter
- When creating sample sets the user now has the option to use criteria from other existing sample sets, making it very easy to combine sample sets
    - when creating multiple sample sets the user can now add additional criteria to all of the multiple sample sets created

    - when adding samples to a static sample set, you can also select to add the unselected samples to a sample set, creating the set complement of the selected samples
- Rule sets are created in their create dialogue
- Artefact tree folders can have their contents sorted. This uses a natural sort order, that works for wells, etc, as well as normal text. The sort is case insensitive
    - user folders (yellow in colour) can be added to any existing (blue) base folders, and moved anywhere in the tree
    - folder information can be added to user folders and filtering will respect this
- An artefact collection concept has been added to the system allowing user to export (nested) folders as templates, enabling groups of artefacts to be exported together as a single collection, often supporting a specific workflow
    - if a sample set or palette is exported applied to several artefacts only a single instance is imported the referenced from the other artefacts helping reduce the number of instance created
    - users can provide tags, a description and a help link for artefact collections
    - we have added support for auto-artefact collections and provided several examples to illustrate their power in supporting standardised workflows
    - any artefact type, including dashboards, can be contained in artefact collections
    - users can create and add their own artefact collections, using the same folder as the user auto-artefacts
- Maps: where possible we will convert the coordinate system of shapefiles to the correct WGS84 Lat/Long projection when reading. It is no longer necessary to use a GIS system to convert shapefiles to WGS84 Lat/Long for use in p:IGI+
    - shapefiles will read UTF-8 encoded field values
    - shapefiles will support geometries which include a ‘Z coordinate’
    - the toolbar can be hidden on the map, as can the lat/long position which can be especially useful on dashboards
        - zoom to data, label points, and open layer manager have been added as a right click option
    - the data, filter and project summary can be shown on the maps and the position can be set to top, right and bottom
    - maps are now constrained to -180 to +180 degrees longitude
        - this means you can only ever see one ‘world’ at a time, and ensures the data summary will always give the correct count of the number of samples
    - the map size can be set like graphs to allow users to copy identically sized maps
    - users can zoom on a map using the rectangle zoom tool
- Graphs have been improved to allow user to set the size more effectively
    - the information summary on graphs has been split into a data summary, a filter summary and a project summary
        - these can be placed above, below or to the right of the graph area allowing for better use of space, especially on dashboards
            - this is controlled per graph from the Layout tab in graph manager. Selecting the information summary layer gives the placement options

    - user can select to show the coordinates of the points on scatter plots, depth plots and multi-depth plots
        - available from the Layout tab on graph manager in the Coordinates layer
            - can set the display precision by selecting the Coordinates layer
    - histograms now show out of range data correctly
        - the bars are clipped at the top of the graph space
    - user defined graphs are created with the title off by default
- The project analysis overview has been improved to show all property groups with slightly more detail in the breakdown

Machine learning features

- A new learning set finding tool has been developed in p:IGI+
    - you can select to find a good learning set across all properties and samples in your project, of you can restrict your selection based on a page or sample set
        - optionally select the minimum number of values in a property to be considered for inclusion
    - select the groups of properties to be considered for inclusion based on the advanced property filtering
    - once the data from the selected properties has been identified, you can then select which property groups, and indicators to use
    - optionally select a target property which you want to try and predict
        - select to only include samples which have the target property
        - optionally choose only properties with at least a certain number of values for the target property
        - select whether to use mutual information (and the associated threshold) to select inputs that are informative about the target property. Mutual information is a generalisation of correlation, and describes the amount of information (entropy) that one property gives about the other property
    - you can then select whether you want to have more samples (rows), or more properties (columns)
        - additionally, you can specify the minimal % of properties that must be occupied per sample, and samples that must be occupied per property
    - interaction allows you to explore many options to get a suitable data set for machine learning (or more generally for data exploration)
        - once happy with the options you can name the page and static sample set to create to show the data
        - this page can then be used for training machine learning models
- The machine learning tools can now be used alongside p:IGI+, allowing you to interact with maps, graphs, pages etc in p:IGI+ while also using the ML tools, saving a lot of back and forth when building models
    - the user is notified if any data used in the ML models has been changed in pIGI+ preventing saving models using the wrong data
- Machine learning models can now use the same property in multiple indicators as inputs

    - the property names now include the indicators and units for better contextual information in the ML tool
- Machine learning models can be saved as templates and moved to other projects
    - right clicking on the model in the ML model manager provides the export model option
    - an import model button is provided at the top of the list of models in the model manager
- Preprocessing includes an outlier detection feature
    - the feature allows control over the sensitivity of the detection methods
    - exploratory tools allow exploration of the reasons for samples being outliers
- Regression model support log and square root transformations of the input properties
    - we have added Gaussian process regression, which sends back error bars with the predictions
- The ML tools support classification
    - visualisation of class assignments, and misclassifications supports the inspection of the models
    - performance of classification models is supported through confusion matrix and ROC analysis
- Clustering visualisation has been improved
    - colouring of clusters is more consistent between different models and cluster numbers
    - the colouring of the dendrogram reflects the cluster colours allowing a clearer overview of the splits in the data
    - the naming of the clusters from a hierarchical cluster model shows the path to the clusters allowing reconstruction at lower levels of detail
    - visualisation supports 2D and 3D reconstruction in the reduced dimension space given by the dimension reduction approach, or spatially (lat, long, depth) or in data space
    - users can select samples in the views and remove these from further analysis

Metis specific features

- Support for uploading PVT files (.pdf, .xlsx, .xml, .json) and attaching them to samples or other PVT files has been added
    - PVT files can be the source of data for samples or derived from other PVT files allowing PVT models to be associated with source reports
    - the long term aim is to integrate Metis with Calsep's PVTSim Nova software so that PVT data can be seamlessly shared across departments
    - PVT files can be individually deleted
- Support for uploading chromatogram files (.pdf, .xlsx, .jpg, .png) and attaching them to samples has been added:
    - chromatogram files can be attached to multiple samples and the relevant analyses specific
    - these chromatogram files can then be viewed and retrieved directly from within p:IGI+
    - individual chromatogram files can be deleted

- Sign in: We have improved the sign-in experience with Metis
    - users can now opt to be kept signed in, which should reduce the frequency a user is asked for their login credentials
    - Metis Discover now shares sign in information with p:IGI+ and Transform meaning a user should only have to sign in once rather than twice to download data
- The layers that are shown on the map within Metis Discover are more robust to errors
- We improved the usability of Transform Online:
    - the quick search panel and queries are shared across the Discover, harmonise and file views
    - user queries captured in the activity log can be re-queried directly from within Transform Online
    - the notifications for blocking operations within Metis Transform Online are now less intrusive
- We've made several improvements to Metis Transform:
    - PVT samples with very limited metadata can be uploaded and retrieved in Metis Transform using the Lab#.PVT property
    - project merge within Metis transform can now be undertaken within a sample set if desired
    - fixed a minor issue with matching well samples with non-well samples in Metis Transform
- Wells (candidate wells) can now be manually created in Transform
- Bulk delete: we have introduced a tool that can remove large datasets from Metis

Property model

• To facilitate the storage of data from more complex wells, in particular, from sidetracks/laterals spurred from an original well bore, the **Well** group has been supplemented with a Parent Name and Parent# (ID) property to record the borehole from which the sampled borehole originated came.

o Additional location properties are provided to record the location of the well TD and locate the wellhead using an alternative geoid.

• The **Sample** group sees the relocation of the gas type information from the individual gas groups to the Gas type.Sample property.

o Water depth has also been added to the sample group if needed.

• A Digital Object Identifier (DOI) for the source document has been added to the **Ref** Group

• The **Geol** chronostratigraphy schema has been expanded to include a new Eon level property to assist in recording Precambrian stratigraphy assignments. Alongside this:

o Updated descriptions are provided for the Alternative chronostrat & lithostrat properties to reflect the ability that users can populate these properties from an alternative set of strat tops loaded into the well manager.

o Reported top & base reservoir properties now allow internal reservoir units to be stored in projects. An associated source property for this information is also provided.

• The reservoir associated production index property (**RA-PI**) has been added to the **Pyrol-6** group (S1+S2a)/(S1+S2a+S2b). This is otherwise known as the Total production index (TPIr).

• Additional compounds have been added in the **GC & GCMS** groups to support recently identified peaks from labs, especially APT:

o Halpern transformation & correlation ratios have been added to the **Gasol-GC** group.

o An update to the **Sat-GCMS** group now captures the 10 commonly recognised and reported sesquiterpane peaks from the m/z 123 trace.

o The missing extended hopanes H32-H35ab S&R have bee added from the m/z 205 trace.

• Various additions and cleanup to aliases have occurred to improve the linking for a range of properties reported by various labs.

• Additional **Gas** and **MudGas** ratios were added to assist in Gas and MudGas Interpretation. The equations of **HC (C1-C5)/Non-HC** and **HC (C2-C5)/Non-HC** were edited to ensure a higher calculation rate for samples through the use of summed isomer properties for Butane and Pentane.

o Added run number (**Run#**) to all of the **Gas** and a number of **Extract** groups.

• The **XRD** group has been expanded to include Gypsum, Chlorite, and an Other (with an associated description for the "other" property).

• The PVT property model, relevant to geochemistry has been edited and now includes:

o A **PVT-Ref** group that is used to track the source of sample PVT information.

o A base **PVT** group contains reservoir properties, single-stage flash bulk parameters, fluid production behaviour properties and lab metadata.

o A **PVT-GC** group is present for PVT compositional analysis reported in mol fraction, along with a selection of derived ratios.

o A **PVT-MSep** group is provided for multiple-stage flash derived bulk properties (density, gas-oil ratio, formation volume factor, gas gravity) at various pressure conditions.

o A **PVT-DLib** group is provided for differential liberation derived bulk properties (density, gas-oil ratio, formation volume factor, gas gravity) at various pressure conditions.

o A **PVT-Un** group is provided for unknown derivation bulk properties (density, gas-oil ratio, formation volume factor, gas gravity) at various pressure conditions.

o **.Any** properties have been added where appropriate for use in autographs etc.

- new set of autographs for PVT data.

o The **PVT-Visc** group for flow assurance-related viscosity measurements has been revised. The group now has 3 reporting schemes available within it, depending on the temperature and pressure of the test.

- A **PVT-Flow** group records values from well site flow and fluid measurements, including contaminants. Liquid ratio data (e.g. GOR, etc.) from the previous Bulk PVT group has been migrated to this group.
- The **Bulk** group is retained but has been redefined to hold fluid behaviour properties, which are reported by geochemical labs as part of their standard geochemical reporting where the origin of the data is not recorded.
    - All oil density data in the previous Bulk PVT group has been migrated to this group.

• A new Routine Core Analysis **RCA** group has been added to store basic petrophysics-related information. The property scheme considers the orientation of the unpreserved plug.

• A comprehensive new **XRF** (X-ray fluorescence) group has been added for the elemental analysis of solids. This supports the **Inorg** group, where data from other elemental techniques, e.g., plasma spectrometry, are stored. The creation of this new group also aims to support carbon storage monitoring.

• A new **Pressure** group has been created to enable users to store data needed to identify fluid types and fluid contact locations, and data associated with well drilling safety.

- The work to add this new pressure group also saw the **Mobility** property (Formation mobility is the ratio of effective permeability relative to viscosity) added to the **Phys** group.

• The **Water** group has had an overhaul, with the ionic properties relocated to their own **Ions** group and hydrocarbon and non-hydrocarbon dissolved gas concentrations added to the bulk chemical and physical water properties present.

- A new **Water-Iso** group has also been added to provide a range of stable and unstable (radioactive) isotope properties used on the whole water sample and internally separated components.

Fixes

- When changing the search term in the property selector we now always return to the top entry to ensure the user sees the most relevant suggestions
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To address this save the project, close p:IGI+, restart, and open the project. We have fixed this issue with the upgrade to support the latest .NET version
- Occasionally when resizing graph windows the data view can pan unexpectedly. This is a rare event, but has now been fixed
- When a user loses connection to the licence server p:IGI+ will now behave more gracefully, allowing the user to save their work and exit
- Fixed a potential security vulnerability in auto-artefacts
- Dates prior to 31st December 1899 are now exported correctly, addressing an Excel limitation
- Cloning a statistics artefact will now produce an identical copy of the original artefact

- Sample counts on the top of pages are now correct for project properties with the [*] any indicator
- Editing a project property equation used to not update properly when adding a new exists{} clause – this has been fixed
- Property help will now correctly jump to provide help on a property selected from a page even if the property help is already open
- Addressed some issues when creating and editing overlay / underlay objects in the overlay editor.

Known issues

- From version 2.5 onwards p:IGI+ will no longer open version 1.x projects. Older projects should be converted to version 2.0 or later before updating to 2.5 or later. IGI will be able to provide a tool or a service to update old projects if needed.
- The "Sitka" font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows

Installation issues

Requires .NET framework version 6.0

2.3.0 (from 2.2.6)

Version 2.3.0 includes a range of improvements.

New/Improved features (p:IGI+ and Metis Transform)

- We have introduced the concept of 'auto-artefacts', extending the autographs to all meaningful artefacts: graphs, maps, palettes, pages, statistics, rule sets, dynamic sample sets
    - all artefacts can now be tagged, have a clickable help link added, and include a notes section for explanation / comments
        - users can add / edit existing tags, links and notes – this provides a way to document a project
        - tags can be used as filters in the artefact manager
    - p:IGI+ ships with a set of updated auto-artefacts, including palettes and pages
    - users can create their own auto-artefacts, which can be added at the user or company level
        - companies can set up and manage a shared folder for their own auto-artefacts
        - tags, links and notes are saved with all artefact templates
    - IGI can live update the auto-artefacts to provide a quick response to requests for new autographs etc.
    - all existing IGI autographs have been updated, with added notes to show the source, and links to ig.NET pages explaining the use of the artefact
- Support for uncertain values has been added to the p:IGI+

    - for continuous data we support uncertainty specified as a standard deviation
    - for discrete data uncertainty is expressed as a probability for each category
    - a default mapping is built to assign data from the vitrinite reflectance standard deviation to the vitrine reflectance mean as an uncertainty, thus error bars will be seen on VR plots where the VR data has standard deviation reported
    - the machine learning tools will return prediction uncertainty for regression, classification and clustering (where available)
        - regression uncertainty is derived from predictive uncertainty on the test set; this will be improved upon when we introduce full probabilistic models
    - where present, uncertainty is shown on the visual query tool for brushed samples
- Error bars are shown on scatter, depth, multi-depth and single track multi-property depth plots
    - error bars are drawn to + / - 1 standard deviation
    - error bars are styled using any applied colour palettes, and are brushed on selection of the sample
    - error bars can be shown on log and linear axes
    - error bars are drawn by default but can be turned off in the graph manager layout tab
- Two new data 'statistics' tools have been added for reporting purposes:
    - Contingency tables will allow you to select two text properties, and count the co-occurrence of values in both – this is sometimes called a cross-tabulated count table
        - counts can be shown, or the values provided as a percentage
    - Pivot tables will allow you to select two text properties, and one numeric property, and show the mean, standard deviation, or, mean +/- standard deviation and optional counts in the co-occurrence – this is sometimes called a cross tabulated statistics table
        - display precision can be chosen for the statistics
    - the contingency and pivot tables can be restricted to a sample set
    - results can be copied to the clipboard
- Editing overlays has been improved
    - when editing an overlay, the graph screen size is preserved to ensure the overlay editing shows what will be seen on the graph, and aspect ratio remains unchanged
    - text, rectangles and ellipses can be rotated
        - the rotation is done to preserve the relative orientation (to a line) regardless of the aspect ratio of the plot
    - overlay elements with names / legend entries now have the names shown in the editor for easier selection
- Graphs have been improved:
    - the sizing of a graph now sets the graph area size only, with the window size adjusting to the remaining content, making it easier to copy graphs at an identical size for reports
    - you can now just copy the graph, without needing to hide the legends, or copy both graph and legends
- Visual query has been improved:

    - the properties used in visual query can now be defined and updated in the user settings allow you to customise what you see in visual query and maintain this between projects
    - users can now assign values to samples for all currently brushed samples using visual query (label samples option)
- Palettes have been improved:
    - a new set of default colour palettes for both continuous and discrete properties have been added to make creation simpler
    - users can set transparency for all entries in a colour palette easily, or if desired set it for just the individual entries
    - show all / hide all entries has been moved to the Show column header
- Maps have been improved:
    - users can add an image as an underlay on the map, registering the image to map similarly to graphs
        - the image link is remembered as part of the map so will remain shown as long as the path remains valid
        - the transparency of the image can be set
        - an image legend string can be added to the map
    - users can now colour individual elements in shapefiles based on the value of a selected element in the database
        - new autofill options have been added to allow the user to select useful palettes for shapefiles
        - transparency can be set at the individual entry level, or for all colour used
- Pages have been improved:
    - the existing analysis pages have been removed from the default project
        - interpretation pages have been added as auto-artefacts
    - new page showing all properties with data, which can now show properties with data across the whole project, in a specific analysis / property group, and / or in a given indicator
    - key columns can now be written to user settings to define a default set
    - it is now possible to remove a property from a page using a right click option on the page header
- It is possible to edit an equation for a project property, which will recalculate the values for the project property
    - when creating project properties, units and ratios of the inputs will be fixed to the default unit and ratio
- Machine learning tools will be sent contextual information, including any key columns, and location name, latitude, longitude and base measured depth automatically
    - these are indicated on the model manager

Metis Discover specific features

- Querying in Discover has been made easier using quick search criteria. Common query properties are now shown on the starting screen
    - users can still add more complex criteria if needed

- Deleting samples, wells and harmonisation is all done via a new web application Transform Online

Metis Transform Online:

- Metis Transform Online is a new web application for data managers used to add, edit and remove data within Metis
- Access to the Metis dashboard, harmonisation, upload PVT files and activity log is available from the sidebar
- For members of the PVT foundation partnership PVT files, including source reports in excel or pdf format or ProdML files can be uploaded and assigned to a sample via Transform Online
- Bulk PVT data is extracted from valid ProdML files and ingested into the Metis database.
    - this data is then available in p:IGI+ using the PVT property model

Metis Transform specific features

- Project merge can now be undertaken only within a sample set if desired
- Wells (candidate wells) can now be manually created in Transform

Property model

- A complete PVT property model, relevant to geochemistry has been added, including
    - base PVT group with commonly measured bulk parameters and lab metadata
    - PVT-GC group for a PVT compositional analysis, stored as mol fraction
    - PVT-MSep for multiple stage flash derived bulk properties (density, gas-oil ratio, formation volume factor, gas gravity)
    - PVT-DLib for differential liberation derived bulk properties (density, gas-oil ratio, formation volume factor, gas gravity)
    - PVT-Un for unknown derivation bulk properties (density, gas-oil ratio, formation volume factor, gas gravity)
    - PVT-Visc group for flow assurance related measurements
    - PVT-Flow for well site flow measurements including contaminants
    - .Any properties have been added for use in autographs etc.
        - new set of autographs for PVT data
    - PVT-Ref group for tracking the source of PVT information for each sample
- A new Routine Core Analysis group has been added to store basic petrophysics related information
- A comprehensive new XRF (X-Ray Fluorescence) group for elemental analysis of solids has been added, supporting inorganic geochemistry, with an eye to carbon storage monitoring
    - additional properties in the Water and Phys analyses groups to support measurements related to measure of gas in the water and sediment
- Improved the calculation of gas ratios to ensure maximum population of data
- Water depth has been added to the sample if needed
- Additional compounds in the GCMS groups to support recently identified peaks from labs, especially APT
- Various additions to aliases to improve linking for a range of properties and labs

Fixes

- When changing the search term in the property selector we now always return to the top entry to ensure the user sees the most relevant suggestions
- Rule sets now only write the source rule name if the value is changed
- In project merge allow the user to generate a sample set of merge conflicts even when no merge is possible
- We've fixed a few issues with the colour picker to allow the correct selection of transparency in all cases
    - this does mean the user must always select OK to confirm the change of colour
- We've removed the database identifier from the pages, which used to confuse users, so now just a current row number is shown
- The warning about the use of the "." as the decimal separator is only shown once now
- Fixed an issue with deleting project properties used across multiple pages and artefacts
- Keyboard shortcuts for brushing (Ctrl+B) and pan/zoom (Ctrl+P) should now always work when a graph is in focus
- PCA will always create component scores (PC1, 2, …) in the correct order
- Fixed an issue where undoing an action with the property help window open cause p:IGI+ to crash badly
- Fixed the writing for CSV files to ensure values with carriage return and/or line feeds embedded were saved correctly with a wrapping symbol

Known issues

- The "Sitka" font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying "E_OUTOFMEMORY: Ran out of memory (****)". To address this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue
- Occasionally when resizing graph windows the data view can pan unexpectedly. This is a rare event, and we have not yet been able to isolate a fix. If the original zoom extent is saved, then the user can recover to the desired view by opening graph manager (Ctrl+G) and selecting to restore the zoom

Installation issues

- Requires .NET framework version 6.0

2.2.0 (from 2.1.4)

Version 2.2.0 includes a range of improvements

New/Improved features (p:IGI+ and Metis Transform)

- We have changed the way .Any properties and [*] 'any' indicators work in the software. These are now written when data is changed (import, merge, edit) allowing faster reads.
    - This change will also allow us to better manage the property model moving forward.
- We have made several improvements to the artefact manager:
    - we have added the ability to easily move artefacts to user defined folders using a right-click 'Move to' menu item;
    - we no longer scroll the artefact into view when we apply a sample set or palette child artefact – only newly created artefacts are scrolled into view;
    - introduced an "Advanced artefact filtering" option to allow users to select which artefacts are shown, enabling the selection of multiple artefact types;
    - introduced support for delete on user defined (yellow) folders, which will delete the folder and all content;
- Added trend lines to graphs
    - can be shown for all data, or per colour palette item
    - on scatterplots users can select to show both trend line(s) and equations
    - on depth plots the gradient with respect to depth is shown on the equation allow estimates of change with depth
    - works in the case of log axes, where the line is fit and drawn in log space
- Graphs have a new right-click "Copy only graph" which copies the graph without any of the legend entries (Ctrl+Shift+C).
    - Maps also support the Ctrl+Shift+C shortcut.
- Artefacts will now remember the size and position at which they were last opened, with a given screen resolution.
    - When changing between resolutions, e.g. desktop to laptop and back, artefacts will remember their size on each resolution and open at the appropriate size and position.
- The toolbar has been streamlined to support forthcoming features.
- The maps have been improved:
    - added the visual query and clear selection icons to map toolbar.
    - shapefiles can now have their line and fill colours set by attributes in the associated database. User can select which attribute to use.
    - users can set the default colour used for symbols on maps.
    - users can see the well name / sitename on hover over locations on maps.
    - users can select an attribute from the database file to use as a label for elements in a shapefile.
    - users can set the colour of the shapefile label text

p:IGI+ specific features

- We have introduced a new 'machine learning' option for clients who have joined the machine learning partnership.
- We have improved the PCA and clustering model creation to remove the step to name the model before being able to interact with it.
    - The Models menu on the page right click has been rationalised.
- Added the statistics object to the list of filters on the advanced artefact manager search options.
- Statistics artefacts can be created from a page – all numeric properties will be added to the statistics. This provides a shortcut to calculating statistics for all properties on a page.
    - The default size of the statistics window has been changed to show a typical usage/
    - The user can control which statistics are shown on the statistics artefact.

Metis:

- Metis now limits actions that add, edit or delete data in the centralised database to occur one at a time. To improve the scalability and robustness of the overall system, a user (or group of users) may only perform actions that write to the database when no other operation is in progress.
    - Uploading, deleting and harmonising data are now blocking operations. A blocking operation that is in progress will prevent other blocking operations from starting.
    - Querying and exporting are unaffected by blocking operations and can be conducted while blocking operations are in progress.
    - We do not believe this will impact a user's workflow, data changes are typically not done in parallel.
    - Transform and Discover have been updated to conform to this behaviour.

Metis Transform specific features

- Upload to staging will only allow data to be uploaded when no other blocking operation is in progress.
    - Upload to staging should respond to various error cases more gracefully with specific information when failures occur.
- Project merge now displays the largest sample groups at the top of the list. This will allow users to work through the most complex merges first.

Metis Discover specific features

- Harmonise: Data managers can now ensure text values are consistent across Metis via the harmonisation tool accessible via Discover.
    - Data managers can choose a text property and see all of the populated text values. These values can then be edited to ensure data quality and consistency.
    - Harmonisation can also be conducted within a Discover query. Simple query the data you wish to limit the harmonisation to. The tool will then harmonise within this set of samples.
    - Harmonisation is a blocking operation and can only be started when no other blocking operation is in progress.

- Dashboard: A dashboard tool showing if a blocking operation is currently in progress, who started the operation, when it started and the type of operation.
    - The dashboard also shows the Update History, a record of all the uploads, deletes and harmonsations that have occurred over a 7 or 30 day period.
- Property selector preference: When selecting a property the default combo-box selected can be defined. Users who prefer to start straight from the property combo-box can now choose to do so!
- Added rectangle drawing tool: This makes it easier to draw rectangles, rather than being limited to drawing only polygons.

Property model

- We have added a number of molecular and isotopic properties to better cater for APT and other analyses. The gas model has been revised to cater for APT style reporting of hydrocarbon gases including C6+ and CO2 components. The changes also mean more gas ratios will be calculated where data is available. We've also added ratio properties to improve autograph calculations for the C6 and C7 alteration triplots.

Fixes

- We have removed the need to install Direct X9, meaning that p:IGI+ installation should be simpler.
- We have fixed an issue in the table detection in import, that meant table detection did not work when the file had a multiple of 20 columns.
- We have fixed issues with errors in pages (e.g. adding a property, then undoing this; adding new samples to pages with a sample set and sort on).
- We now provide more sensible defaults for the [un] unknown indicator units in the creation of project properties.
- We have simplified the gasoline alteration triplots, by adding specific properties to support their calculation across analyses and indicators.
- We have fixed spelling errors in autographs.

Known issues

- The "Sitka" font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying "E_OUTOFMEMORY: Ran out of memory (****)". To address this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue
- Occasionally when resizing graph windows the data view can pan unexpectedly. This is a rare event, and we have not yet been able to isolate a fix. If the original zoom extent is saved, then the user can recover to the desired view by opening graph manager (Ctrl+G) and selecting to restore the zoom

Installation issues

- Requires .NET framework version 6.0

2.1.0 (from 2.0.4)

Version 2.1+ of our software is a significant upgrade for both p:IGI+ and Metis. If you did not upgrade to 2.0.4 then it is essential you upgrade to 2.1.4 as that involves significant changes to the underlying data storage, offering the opportunity to further improve things moving forward.

The changes require a 'migration' of existing projects and databases to the new format (preserving the original .pigi /.Metis file). The process to migrate older projects to version 2.0+ will begin automatically when selecting to open a previous version project file in the new software. A separate application will start to run the migration, and then, as p:IGI+/Transform 2.1 has been registered to open .pigi2/.metis2 files, once finished p:IGI+/Transform v2.1 will launch opening the migrated project. If you have already migrated your projects to version 2.0.4 no further migration is required.

The need for project migration means projects created/edited in version 2.0+ will no longer be usable in version 1.xx of the software.

It is possible some files will have problems when migrating. In this case we suggest you send these files to support@igiltd.com and we will investigate and fix any issues.

New/Improved features (p:IGI+ and Metis Transform)

- The layout of the main application window has been improved. By default p:IGI+ will open occupying half the screen, on the right.
    - All child windows are owned by this parent window, so graphs, maps, and other artefacts won't be hidden by the workspace. This allows more effective use of screen space.
        - Graph manager and visual query can be used more effectively with multiple windows open.
    - Several dialogues have been revised to ensure they work effectively on smaller screen sizes.
- Rule sets have been added to the software. Rule sets allow users to define a series of rules, which use sample set expressions to build up complex rules, writing a target string into a selected text property.
    - Where the selected text property has an associated list of suggested values, these are used as suggestions in the rule labels.
    - Multiple rules can be built for a given target property re-using the sample set expression elements.
    - The user can select to write the rule name into a separate property to ensure a later user is aware of the rule set used to write the value.
    - The user can select when, and to which samples, a rule set is applied.
    - Rule sets can be shared between projects as artefacts, cloned and updated.
- It is possible to connect directly to a Metis environment from within p:IGI+, select the data wanted for the project at hand (by defining a query) and choose to link (and download) this data to your project.
    - Once you have linked data, you can also check for any data updates, which will identify whether any samples have changed on the Metis server, or whether any new data has been added given your initial query. You can then update your project data with the data updates smoothly.

    - You can edit the query used to define the data in the project, to add new data that you might need to extend or refine the study.
    - When adding or modifying data a static sample set of what is new / what has changed can be created.
    - You can connect to different Metis instances, for example IGI's publicly available NPD data release for the Norwegian North Sea, and your own internal Metis database.
    - You will be shown in p:IGI+ that your project is linked to a Metis instance and is derived from a query.
    - Samples which come from a link to Metis will be labelled in the Sam Status.Metis property.
    - Downloading linked data can be undone, and redone.
- We have improved the treatment of wellbores. Wellbores are now no longer only determined by the well name – rather the well is determined using the well name, unique well identifier, country, internal#, ihs#, location, and (lat,lon).
    - The well artefact names have been modified to show the well name, and in brackets the country and lat, lon. This allows user to have multiple wells with the same name, so long as they are in different countries or have different lat, lon.
    - We have modified all linking from Metis, and import, including well import, to enable this.
        - You can no longer import a p:IGI-3 well manager (.wmg) file in version 2.1
        - Other well import files, especially for deviation surveys, and formation tops, have been modified to allow the user to include a UWI, country and lat, lon in addition to the well name.
- Import has been improved to make it more robust.
    - Import is now able to detect and include indicators, units and ratios in the property header row. We've also improved the auto-detection of these, and the table detection and identification of headers and data in Excel files.
- The property model has been completely removed from the application code and resides in your Roaming profile enabling us to update the model faster moving forward.
- Line graphs now show only the properties on the axis labels by default helping the graph use space more effectively. A button allows the user to append the analysis names if desired.
- Graphs will no longer copy the brush symbol when copied with brush model active.
- Users can control the size of stratigraphy labels on depth plots.
- When exporting an artefact as a template the filename is pre-populated based on the artefact name.
- When using lists of properties, for example when editing pages, the presentation of the properties has been made consistent across all tools, and shows the Short Name for clarity. The Long Name can still be seen on hover.
- Indicators, units and ratios can be easily edited on the statistics artefact.
- "Edit page…" option added to top of right-click page menu.
- The source of sample level stratigraphy is now automatically populated from the well stratigraphy information if present.

p:IGI+ specific features

- PCA and Clustering have been further updated to improve the way we manage and store the training data means and standard deviations. Unfortunately, this is a breaking change, and PCA and Cluster models created before version 2.1 will need to be recreated and retrained. This should be relatively fast since the projects are likely to contain the pages that define the training data. We apologise to users affected by this.
- Allow PCA to calculate principal components even when you have fewer samples than properties.

Metis Transform specific features

- As well as being able to link to data in Metis as described in the p:IGI+ section, you can also push back the changed data to Metis Service. If the data was linked from Metis, this will maintain the wellbore and sample identities, and automatically merge with the correct wells and samples on the server.
- Users can now (multi-)select samples from the spreadsheet and right-click on these to select to manually assign these samples to wells.

Metis Discover specific features

- UI Improvements
    - Metis will zoom to the extent of data on the server when it first loads.
    - It is possible to customise the properties shown in the sample data preview.
    - Each criterion now includes a summary description allowing you to see how they each contribute to the overall query.
    - Tooltips have been added to Discover, along with keyboard shortcuts for common actions.
    - Discover can be configured so each instance can be named, the maximum export size can also be adjusted.
    - It is possible to export data using the default number of decimal places in the property model, or to full precision stored.
- Querying for text properties has been improved to allow the user to define the search terms they wish to use more easily.
    - A significant number of properties allow for an exact string to found. Using “equals” allows a collection of strings to be searched for that match in a case-insensitive manner.
    - Furthermore, partial matches can be found using “contains”. If there’s less than 1,000 distinct values in Metis for a particular properties all values will be shown initially. A search term can then be provided to filter these values further, any text string that partially contains the search term will be returned as long as there are less than 1,000 results.

Metis Server

- It is possible to view activities that have occurred on the Metis system, including queries, exports, linking and deleting data. Information is provided about who, when and what is stored.
- Export is significantly more performant and can be cancelled if the user leaves the session.

- Deleting samples has been made more performant and robust.
- When a criterion is removed from a sample set, the expression is automatically updated to the remove the criterion, making for simpler editing of sample sets.

Property model

- Over the past year we have collaborated with APT to provide our mutual clients with a data export format compatible with IGI's geochemical software products (Metis Transform and p:IGI+). This has led to the following changes in the property model:
    - Additional 1st, 2nd and 3rd internal standard properties have been added across the model. The 1st and 2nd internal standard properties are now present for all molecular analysis groups, whereas the 3rd internal standard is present across GC-MS and GCMS-MS analysis groups.
    - An additional 4th internal standard property (value & name property) has been created and added to all molecular GC-MS and GCMS-MS analysis groups.
    - An extension to the alkyl-Benzenes monitored from WO-GCMS, now including a set of peaks monitored on their molecular rather than their fragment ion (e.g. m/z 134, 120, 106 & 92).
    - Increasing the capture of Ethyl-,Tri- and Tetra-MethylAdamantanes and MethylDiamantanes peaks across the whole, saturate and diamondoid GCMS groups.
        - Along with the capture of diamondoid properties a set of key equations have been added to the Diam-GCMS analysis group.
    - The pyrolysis-GC extract (Py-GC-Extr) group has been extended to mirror the pyrolysis-GC (Py-GC) group with respect to the properties that data can be linked to.
    - The auto-populate equations linking extract recovery weight through to the respective fractionation SARA group sample weight properties (Sam wt.Precip, Sam wt.SARA-Wt etc.) have been removed. This now allows users to define the weight of sample used in SARA equations as it is often an aliquot of the volume extracted.
- In a similar manner, IGI has been working with Stratum Reservoir to provide clients with a data export format compatible with IGI's geochemical software products. One area which has benefited from this collaboration has been a review of the property model microscopy groups; VR, VisK-TL, VisK-RL and K-Colour. This has led to the following changes in the property model:
    - The ability to store raw VR measurements for a sample. This will take the form of a comma separated string of values linked to the new (Raw Val.VR) property.
    - The inclusion of a more detailed kerogen composition fluorescence (blue light or UV) model in the K-Colour analysis group. Data relating to colour and intensity from a specified fluorescence filter can now be captured for present sporinite, alginite and amorphous organic matter components of the sample.
        - Note: the previous liptinite fluorescence model properties consisting of: Fl colour, Fl Colour Desc and Fl Max will remain in the K-Colour group.
        - Note: the previous sporinte fluorescence model properties consisting of: Spore Colour and Spore Colour Desc will remain in the K-Colour group.
    - The addition of additional vitrinite other (Vit Other) and alginate other (Algin Other) sub categories to the visual kerogen TL and RL groups, where inclusion to any of the

other vitrinte/alginite subgroups is impossible due to a poor state of preservation or lack of diagnostic features preventing identification. As a result, the appropriate vitrinite and alginite sum equations have been updated.
    - An “other” description property has been added to both the VisK-TL, VisK-RL groups to provide users a space to record what has constituted the value linked to the other property in each group.
- IGI has updated the descriptions for a range of geologically associated location properties (Geol Prov, Basin and Sub-Basin) present in both the Well and Sample groups. The new descriptions clarify that the property name is designed to represent the locations scale and that a variety of entries other than just basin names e.g. horst, grabens, platforms, highs etc.
- A new oleanane ratio (Olean Ratio) has been added to the GCMS and GCMS-MS groups. This new equation ratios the 18a(H)-Oleanane against the 18b(H)-Oleanane from m/z 191 when the individual peaks can be identified.
    - This is not to be confused with the Oleanane Index (OleanIndex) which sees Olean (the sum of the 18a(H) & 18b(H) isomers) ratioed against C30ab Hopane (H30ab).
- IGI has worked closely with clients to fix the equation associated with the Rock Eval-6 (Pyrol6) pyrolysable organic carbon (PC) property. This fix to the PC equation will correct in-group derived TOC and any secondary property values (e.g., HI and OI).
    - Previous equation: ((S1+S2)***0.83**)+(S3*12/440)+((S3CO+(S3'CO/2))*12/280)
    - New equation: ((S1+S2)***0.083**)+(S3*12/440)+((S3CO+(S3'CO/2))*12/280)

  Testing the effects of an incorrect PC equation in the Rock Eval-6 part of the property model highlighted the main impact on immature Type I and Type II kerogen prospectivity. Mature samples are affected less.

- The descriptions for the C1-C5 %HC gas properties, present in all Gas and MudGas analysis groups have been edited to ensure it is the clear that data linked to these properties should consist of normalised percentage values from a samples gaseous C1-C5 fraction.
- Note: these properties will be automatically populated if the whole gas concentration data is present in the model.

Fixes

- Updating p:IGI+ version 1.x projects correctly releases the licence file.
- Fixed an issue when trying to merge samples with dates, into samples without dates in Transform.
- Addressed a long standing issue where the cursor could occasionally jump when typing a property name in the property selector.
- Non-well locations should now appear on maps in Transform correctly.
- Fixed correctly setting the default unit group for molecular project properties for the [un] indicator.
- Re-ordered the import menu to provide a more natural order, with Excel the first option.
- Added maps, and PCA, clustering and rulesets to artefact filter options.
- Fixed an issue for the bulk update when the Apply button remained enabled when a change to a null analysis was selected.
- Added a scroll bar to Excel import for files with very large numbers of sheets.

- Moved well data to left of the 'Page showing all properties with data' to ensure populated well information is shown first on the page.
- Fixed a problem with selecting the target property in cluster models.
- Improved the robustness of PCA and clustering. Allow cluster models to target all text properties.
- Fixed an issue when cloning PCA models – ensure they target their own project properties in which to write the PC scores.
- Fixed a problem with having static and dynamic sample sets with the same name.
- Fixed an issue where the undo button was not being enabled after an import of data.
- We fixed an incorrect unit definition. The milliPascal (mPa) unit was actually a megaPascal (MPa). We have renamed the unit, and added a correctly defined milliPascal.

Known issues

- The "Sitka" font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying "E_OUTOFMEMORY: Ran out of memory (****)". To address this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue
- Occasionally when resizing graph windows the data view can pan unexpectedly. This is a rare event, and we have not yet been able to isolate a fix. If the original zoom extent is saved, then the user can recover to the desired view by opening graph manager (Ctrl+G) and selecting to restore the zoom

Installation issues

- Requires .NET framework version 6.0
- Requires DirectX 9 for the graphs to work

2.0.0 (from 1.28.7)

Version 2.0 of our software is a significant upgrade for both p:IGI+ and Metis. It is a strongly recommended upgrade, that involves significant changes to the underlying data storage, offering the opportunity to further improve things moving forward.

The changes made require a 'migration' of existing projects and databases to the new format (preserving the original .pigi /.Metis file). The process to migrate older projects to version 2.0 will begin automatically when selecting to open a previous version project file in the new software. A separate application will start to run the migration, and then, as p:IGI+/Transform 2.0 has been registered to open .pigi2/.metis2 files, once finished p:IGI+/Transform v2.0 will launch opening the migrated project. The need for project migration means projects created/edited in version 2.0+ will no longer be usable in version 1.xx of the software.

It is possible some files will have problems when migrating. In this case we suggest you send these files to and we will investigate and fix any issues.

New/Improved features (p:IGI+ and Metis Transform)

- Performance has been improved across the software. Memory usage has been reduced in many places, and speed enhanced in some. This remains a work in progress. There are known performance issues when exporting all data from large projects (>30,000 samples)
- The .pigi2 and .metis2 file extensions will be registered with Windows as part of the installation, meaning the files can be double clicked to open in the applications, and will have the p:IGI+ and Metis icons associated with them
- Sample data can be exported directly in Excel format from p:IGI+ and Transform
    - users can select to export whatever subset of samples and data they want based on the use of pages and sample sets, however it is not possible to export very large projects to Excel due to memory limitations in Excel
    - when .Any properties are included in the export, users can select to export either the .Any property value , or the raw measurements that contributed to them. Note if the .Any property value is chosen the source of the value is not recorded
    - the export of the data is complimented by an export summary sheet added to the Excel file that documents the source of the data
- Date-time support has been added across the property model and software features
    - for existing projects date-time properties (but not the Historical entry date properties) will be migrated from text to date-times
    - the since data within a project might have come from many different sources, the migration will attempt to convert the strings to valid date-times using a range of different cultures / national conventions. Where a unique conversion is possible the value is written to a date-time result. Where multiple conversions are possible, or where no conversion is possible the original date-time string is moved to the following comment properties, being appended if an entry is already present:
        - Date.XXXX -> Lab comment.XXXX
        - Sampling date.Sample -> Sample comment.Sample
        - Start date.Well -> Well comment.Well
        - End date.Well -> Well comment.Well

        - Compl date.Well -> Well comment.Well
    - internally the date-time data is stored in a standard ISO8601 format ("YYYY-MM-DD HH:MM:SS.SSS") with time store in universal time coordinates (UTC, or Z)
    - when importing date-time data, by default the users current Windows region/country settings are used to determine date-time format, however the user can over-ride this to force the software to assume month – day – year order (US style) or day – month – year order (Europe and most of the rest of the world style)
        - all times are assumed to be specified in UTC (universal time coordinates) unless an explicit time zone relative to UTC is provided (e.g. 2021-10-24 12:34-06:00). If only a date is provided, the time is assumed to be 00:00 (midnight) in UTC. This is true for all input mechanisms: import, pages, merge
    - when editing date-times in the spreadsheet the software attempts to parse the users input assuming the current windows region/country settings and will warn the user if conversion is not possible. It will accept many date-time formats
        - the user can select to display date-times on pages in a range of visual formats
    - date-time data can be merged as part of the well and sample merge processes
    - date-time data is exported in the ISO8601 standard to ensure unambiguous values are provided
        - when exported using the .zip option, if the included .txt is opened in Excel, the Excel application does not treat date-time data correctly, and consequently will require some modification to use the data correctly, although the strings will be absolutely correct – we suggest users use the new Excel export option in p:IGI+ which does not have this issue, with date-time presented in an appropriate custom format
        - when manually copied, date-time data uses a format which Excel will recognise as a date-time when pasted
    - sample sets can be created based on date-time criteria, being able to query for samples before a date-time, after a date-time or during a date-time interval. If time is specified this will be assumed to be in UTC format (universal time coordinates)
    - palettes can be created for date-time properties enabling users to explore, for example, the temporal evolution of property relationships
        - the binning of date-times uses an intelligent algorithm to select sensible bin edges, depending on the scale of the variation, preferring the start of years, months, weeks, days, hours, minutes and second, with naturally sized bins
    - date-time series can be plotted using the new Time Series Plot type
        - the time axis uses an intelligent algorithm to select sensible tick marks by default – time is always shown as UTC
        - it is possible to show a time series for any numerical property – by default all data for that property is assumed to come from the same time-series
        - where there are multiple values at the same time an envelope is drawn to include all data from that time-series
        - the user can select to show points only, points and lines or lines only from Graph Manager → Layout tab → Data

    - where there are multiple time series for a given property, the user can identify each time series by using a colour palette. The colour palette is used to group the data into separate series which are then shown in the relevant colour
    - the brush selection of samples is possible to and from time series plots
    - data point labelling can use date-time properties
    - visual query supports date-time properties
    - overlays, underlays and range underlays can be added to time-series plots, although editing these is purely manual using drag and drop
- Sites on maps can now be labelled:
    - the user can select any property as the label
        - numeric data presents the mean +/- standard deviation, and in brackets the number of samples used to calculate the site statistics
        - text and date-time data shows a list of the values/strings present at the site, ordered by frequency
    - the user can select which sites to label using brushing
    - labels are drawn on top of the data points so are always visible
- Increased the limited on the number of shapefile that can be added to Maps. Users can now add a maximum of 20, but the user is reminded that large numbers of shapefiles will impact the performance of pan-zoom on the map
- Samples can be selected for brushing from pages using a right-click option or keyboard shortcut Ctrl+B on an active page (Ctrl+Shift+B clears the selection of single samples) styling of brushed and selected points has been enhanced to show selection alongside all other stylings
- Ctrl+L works to clear the whole brushed set across all contexts, not just graphs
- Users can link to external resources (described using a URI – web pages, web links, file paths) from pages and visual query. Users can quickly launch dynamic links to open the resource in whatever viewer is registered for this on their system. Add a text link like https://www.igiltd.com/ or D:\Data\Chromatograms\XYZ1234a.png to a text cell and this becomes navigable *if the link resolves to a resource on your computer*
    - use Ctrl+E to open the external resource from a cell if selected, or right-click and select to “Open external resource…”
    - when external links are shown in visual query, simply click on the link to open the external resource
- Updated the right click menus on pages to reduce clutter. Put page configuration actions on the page’s property header right click menu, and sample manipulation / data actions on the data grid right click menu
- Improved the treatment of properties IGI has deleted from the property model. On pages, the page can be opened, and the deleted property is automatically removed from the list of properties shown.
- Added many symbols to the shape palette to provide the user with 100 distinct shapes.
    - improved the user selection of shapes to use a grid
    - improved the autofill option for shape palettes to autofill from the first user selected shape, allowing the user to easily autofill from a specific point in the list of shapes
    - improved the palette legends to remove clipping of the later palette elements

- Editing of discrete palettes has been improved, allowing the user, when in the edit palette assignment dialogue, to sort the palette entries alphabetically, or on frequency of occurrence
- The Import data route has been heavily revised, to improve the robustness and performance of the autodetection, and improve the flexibility of what can be imported
    - import will attempt to automatically detect headers and data rows – the logic for this has been re-written to improve the robustness of the detection
        - import will now attempt to identify the presence of indicators, units and ratios
        - ion channel detection has been improved
        - indicators, units and ratios can be on separate rows, or contained in the main property description row, enclosed in a symbol e.g. ( ), [ ] etc.
        - aliases for indicators and ratios have been extended and where these are present they will be used to auto-link
        - this will greatly simplify the import of APT lab data once this export route is finalised
    - when linking manually, if you select 'Accept and Next' the indicator and unit from the previous selection is retained
    - table detection for Excel import no longer removes cells with a colon in them, for example 'nC23:1' would be retained in the header
    - metadata is better detected and always placed on the correct rows no matter how many header rows there are
    - data being imported is stripped of all leading and trailing white space
- the use of aliases in the property search has been enhanced to make it simpler to find properties based on their aliases
- The import well data route has been revised, adding autodetection of incoming well file structure to determine the well information being imported (p:IGI+ well file, stratigraphy, well information from Excel etc.)
    - stratigraphy information from Excel files can now be imported to one of two stratigraphy schemas (each now with its own tab in the artefact well manager)– the primary stratigraphy (tops) scheme or an alternative stratigraphy (tops) scheme. Once loaded these will populate the primary and alternative sample level stratigraphy respectively, allowing you to manage e.g. company tops, and official national oil and gas authority tops in the same project
        - this is available for both Chronostratigraphy and Lithostratigraphy tops
        - when importing stratigraphy tops (primary / alternative) the user can opt to provide a label to indicate the source of these tops
        - primary and alternative tops are exported with .igi_well files
    - when populating stratigraphy from formation tops all existing values of sample stratigraphy are blanked to ensure a single source of stratigraphy in a given property
    - stratigraphy provided at the sample level with the data can be stored in the Reported stratigraphy properties
    - the user can select whether to show the primary or alternative tops on depth plots using graph manager

    - when importing a .igi_well file created in a version 1.x of the software into version 2.0 the stratigraphic tops are imported to the primary stratigraphy (tops) scheme
- Well names are now case sensitive across the software
- For dynamic sample sets a descriptive Expression Summary has been add to the create dialogue. This is automatically generated as the associated query string is built up
    - the Expression Summary has also been set as a tooltip on hover over the sample set icon, allowing the users to easily see what the sample set is comprised of
- Removed the 'out of range' data shortcut icon from the toolbar (as it was previously unclear whether the feature had been toggled on or off). Operation of the out of range feature now sits on the Page menu with options to turn it on or off
- Added an application help dialogue with information about where to get support – linking to the online user guide, and providing the support email. This is location on the Help Menu
- Added new autographs:
    - Line plot: n-Alkane d13C C7-33.GC-IRMS
    - Line plot: n+i-Alkane d13C C7-33.GC-IRMS
    - Line plot: Galimov Diag
    - Line plot: %Homohop[a].Sat-GCMS
    - Scatter plot: Oil Density vs Pour Pt
    - Scatter plot: nC17/nC27 vs Pregnanes[*].Any
    - Scatter plot: nC17/nC27 vs Pr/Ph[*].Any
    - Scatter plot: t22/t21 vs t24/t23[*].Any
    - Scatter plot: t26/t25 vs H31abR/H30ab[*].Any
    - Scatter plot: C2/C3[mol].Gas vs d13C C3-C2.Gas-Iso
- Various graph name, plot title, and axis title edits made across existing autographs

p:IGI+ specific features

- PCA has been updated to make it a full artefact, allowing retraining and providing improved sharing between projects
    - PCA models are launched from either the new Model menu or from the right click menu on pages
        - models can be created, trained and applied to subsets of data defined by pages and sample sets
    - normalisation of data (for e.g. raw GC measurements) is applied prior to mean replacement options ensuring sensible replacement of missing values
    - options for replacing missing values have been expanded to include replacement with the minimum observed value, or replacement with a user specified value (relevant for e.g. missing GC peak heights / areas, which are likely to result from non-appearance of a specific peak in the chromatogram)
    - when applying the model users can control on which sample set to calculate the model and what they wish to do with missing values, allowing users to predict the 'principal components' (component scores) for samples with partial information
        - the same range of missing value options is available, as provided in training
    - project properties are created for the principal components (scores) automatically and renamed if the model is renamed

    - principal components (scores) are calculated on demand, and written into project properties which will be blanked prior to writing the scores into them
    - the user can later select to predict more (or fewer) principal components using the trained model without the need to retrain
    - PCA is a full artefact, so for example training options can be changed in the PCA model, with a graph showing the outcome live, allowing you to visually explore the effect of changing training options
    - PCA models can be cloned to allow users to develop and compare models
- Clustering has been added – the first version provides k-means clustering
    - Clustering models are launch from either the new Model menu or from the right click menu on pages
        - users can select the data set on which to train their clustering model, with the same missing value replacement options, and pre-processing as available in PCA
    - users can select the target number of clusters to create, up to a maximum of 20 clusters
    - once trained the model can be used to cluster samples from the same, or a different sample set as used in the training
    - users can select which property the cluster labels are written to ('Cluster 1', 'Cluster 2', etc) – this can be a project property, indeed we would recommend creating a project property for cluster labels as any other values in this property will be deleted before writing the cluster assignments
    - a palette for the selected label property is automatically created and entries added for the clusters – this palette is ready to be applied to any graph, map or other artefact
        - the palette interacts dynamically with the cluster training allowing users to explore different clustering options and see the effect on graphs, maps and even statistics
    - cluster labels are written as text and can be harmonised (to change names to something more meaningful) or used in other artefacts, for example sample sets
    - cluster models can be saved as templates and applied in other projects
    - cluster models can be cloned, to allow users to easily compare different model choices

Metis Transform specific features

- As well as the general improved performance and scalability, the scalability of upload to Staging has increased, allowing more efficient updating of data.

Metis Discover specific features

- Query performance has been significantly improved
- Introduced several new types of criteria that can be used to query data
    - Data updates criterion can be used to query when samples have been added or updated in Metis
    - Geographic criterion specifically query location data in Metis
    - Measurement criterion can be used to query any individual property within the property model

    - Stratigraphy criteria can be used to search for either lithostratigraphy or chronostratigraphy data across the database
- Queries can now be bookmarked and saved for later use. They can also be shared with colleagues, edited, and removed
- Wellbore viewer. Each wellbore returned by a query can be viewed in detail.
- Export performance has been significantly improved. Users can now export up to 40,000 samples
- As well as exporting data by analysis groups, data can also be exported by properties. Up to 20 properties can be selected to export a subset of the data
- Discover can be integrated with an ArcGIS or Web Map Service (WMS) to show layers on the map. Layers are configured at a server level, as a result they are visible to anyone who has access to the environment. IGI are happy to provide support to configure this feature
- Metis now captures queries and exports performed by users in an activity log. The activity log is only viewable by data mangers within an organisation. The who, what and when of each query or export, along with the time taken, is recorded

Property model changes

- The interpretation aspect of the property model has been completely overhauled
    - the previous interpretation property group has been replaced with separate dedicated interpretation groups for Rock, Liquid, Gas, Mudgas and Fluid (interpretations from the combination of Liquid and Gas)
    - these interpretation groups have an enhanced range of interpretation properties, with source and confidence for each
        - codelists have been added to suggest appropriate interpretation labels
- Added a series of mode, min & max VR equivalent reflectance properties to the MatCalc property group
- Added a rig name property to the well property group
- Added sample temperature (Sam Temp) to the physical analysis group
- Added the reservoir mode properties S2a and S2b properties to the PyrolHawk & Extr analysis group
- Added specific bulk and extracted TOC.Any properties (TOC_Bulk & TOC_Extr) and updated relevant pyrolysis equations to use the appropriate .Any property as an alternative to the analysis specific TOC property as a fallback
- The Pol-GCMS analysis group has been expanded to include ethyl- & dimethyl-carbazoles, Fluorenone & methyl- equivalents and Xanthone & methyl- equivalents
- Deleted several duplicate properties in the model, with a migration of the data to an appropriate property. Data is preserved in the target property if that is already populated
- A series of Alkylbenzene ratios, 1-12, added to the WO-GC and Py-GC analysis groups
- Extended the range properties measured from the m/z 183 ion trace in the Sat-GCMS analysis group
- Added a series of Alkylcyclohexanes (13-34) from the default 83 and alternative 82 ion channel trace, with associated n-Alkylcyclohexane CPI equation properties
- Extended the range of Alkybenzenes in the Arom-GCMS and WO-GCMS analysis groups up to 34ABenz

- The sequence and biostratigraphy properties in the Geol property group have been redefined to be reported properties, capturing values reported alongside the sample
- Source properties have also been added to record where the sequence and biostrat values came from

Fixes

- The software will now work on high resolution 4K displays, at all font scaling sizes
- When creating project properties the equations are now shown using the correct display names for properties
- Users can no longer harmonise on well name – this never worked correctly – instead users should delete incorrectly named wells and assign the samples to the correct well(s). Users are advised of this, but can still access the list of distinct well names provided in the harmonise dialogue
- It is possible to edit the long name for project properties without changing the short name
- Auto-import is more robust, having improved the auto-detection of the column separator
- The definition, and interaction with numerical palette bins has been improved, with clearer feedback to users
- Fixed an issue where it was possible to crash p:IGI+ by resizing a graph to be too small. Also made the resizing of graph windows more responsive, and improved the speed of interaction with graphs slightly
- Fixed a map visual query bug that left a site looking selected when it was not even brushed
- Fixed the positioning of axes ticks / grid lines on the multi-depth plots
- Fixed clipping of ticks on inverted graph axes
- Fixed an issue with the display of formation tops on depth plots, where tops could be drawn at the wrong depths with a very specific combination of different datums being used
- Added a scroll bar to visual query to prevent the window becoming unusable if too many properties were added

Known issues

- It is not possible to use the project merge in Metis Transform using date-time properties if there are missing values those properties – this is being addressed and will be fixed in the next release.
- The “Sitka” font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To address this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue
- Occasionally when resizing graph windows the data view can pan unexpectedly. This is a rare event, and we have not yet been able to isolate a fix. If the original zoom extent is saved, then the user can recover to the desired view by opening graph manager (Ctrl+G) and selecting to restore the zoom

Installation issues

- Requires .NET framework version 4.8

- Projects will be migrated from earlier version to .pigi2 / .metis2 files. This can take time for large projects
- Requires DirectX 9 for the graphs to work

1.29 (from 1.28.) – user group only, not released

Changes to the palettes mean that older versions of p:IGI+ will not open projects (or strictly palettes) from this version of p:IGI+.

New/Improved features (p:IGI+ and Transform)

- Date-time support has been added across the system
    - for existing projects date-time properties will be migrated from text to date-time
        - the since data within a project might have come from many different sources, migration attempts to convert the strings to valid date-times using a range of different cultures / national conventions. Where a unique conversion is possible the value is written to a date-time result. Where multiple conversions are possible, or where no conversion is possible the original string is appended to existing related samples:
            - Date.XXXX -> Lab comment.XXXX
            - Sampling date.Sample -> Sample comment.Sample
            - Start date.Well -> Well comment.Well
            - End date.Well -> Well comment.Well
            - Compl date.Well -> Well comment.WellSite
        - internally the date-time data is stored in a standard ISO8601 format ("YYYY-MM-DD HH:MM:SS.SSS") with times store in universal time coordinates (UTC, or Z).
    - when importing date time data, by default the users current Window region/country settings are used, however the user is able to over-ride this to force the software to assume month – day – year order (US style) or day – month – year order (Europe and most of the rest of the world style).
    - when editing date-times in the spreadsheet the software attempts to parse the users input assuming the current windows region/country settings and will warn the user if conversion is not possible. It will accept many date-time formats
        - The user can select to display date-times on pages in a range of visual formats
    - date-time data can be merged as part of the well and sample merge processes
    - date-time data is exported in the ISO8601 standard to ensure unambiguous values are provided. Excel does not treat date-time data well, and this will require some processing to bring correctly into Excel, although the strings will be absolutely correct
        - when copied date-time data uses a format which Excel will recognise as a date-time when pasted
    - sample sets can be created based on date-time, being able to select before a date-time, after a date-time or during a date-time interval
    - palettes can be created for date-time properties to show the temporal evolution of a relationship for example
        - the binning of date-times uses an intelligent algorithm to select sensible bin edges, depending on the scale of the variation, preferring the start of years, months, weeks, days, hours, minutes and second, with naturally sized bins
    - time series can be plotted using the new time-series graph type

        - the time axis has a special formatting and selects sensible tick marks by default
        - it is possible to show a time series for any property – by default all data for that property is assumed to come from the same time-series
            - where there are multiple values at the same time an envelope is drawn to include all data from that series
            - the user can select to show points only, points and lines or lines only
        - where there are multiple time series for a given property, the user can select to identify each time series they wish to show using a colour palette. This is used to group the data into separate series which are then also shown in the relevant colour
        - brushing is possible to and from time series plots
    - data point labelling can use date-time properties
    - visual query supports date-time properties
    - overlays, underlays and range underlays can be added to time-series plots, although editing these is purely manual using drag and drop
- Data on maps can be labelled:
    - the user can select any property to label with
    - numeric data presents the mean +/- standard deviation, and in brackets the number of samples used to calculate the site statistics
    - text and date-time data presents and list of the values/strings present at the site, ordered by frequency
    - the user can select which sites to label using brushing
- Added a large number of symbols to the shape palette to provide the user with 100 distinct shapes.
    - improved the user selection of shapes to use a grid
    - improved the autofill option for shape palettes to autofill from the first shape, allowing the user to easily autofill from a specific point in the list of shapes

p:IGI+ specific features

- No p:IGI+ specific changes

Metis Transform specific features

- No Metis release

Metis Discover specific features

- No Metis release

Fixes

- The software will now work on high resolution 4K displays, at all font scaling sizes.
- When creating project properties the equations are now shown using the correct display names for properties
- It is possible to only edit the long name for project properties now
- Auto-import is more robust now, having improved the auto-detection of the column separator

- The definition, and interaction with numerical palette bins has been improved, with clearer feedback to users
- Fixed an issue where it was possible to crash p:IGI+ by resizing a graph to be too small. Also made the resizing of graph windows more responsive, and improved the speed of interaction with graphs slightly
- Fixed a map visual query bug that left a site looking selected when it was not even brushed

Property model changes

- No major changes

Known issues

- The “Sitka” font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows.
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To address this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue.
- When importing data, headers with colons ‘:’ in them are being ignored with table detection on. The current solution is to turn table detection off.

Installation issues

- Requires .NET framework version 4.8
- On first opening pre-1.28 projects there will be delay, as the new and revised equations are calculated in the project. Once saved this will not repeat.

1.28.0.xxx (from 1.27.1.xxx)

New/Improved features (p:IGI+ and Transform)

- Interaction with pages has been reviewed and improved:
    - Visual representation has been changed to allow the user to see all relevant information:
        - Out of range highlighting is shown by the cell background colour and is shown for given and derived values.
        - Whether a value is calculated is shown by a green font colour, and italicised font style.
        - Selection is shown by a darkening of the selected area, and highlighted in row and column headers.
        - Sample set application is shown by a strong blue border around the entire sheet.
    - Pages no longer revert to the initial position on most changes, with the currently selected cell being at the top left of the view. We would welcome feedback on this change.
    - It is possible to change the decimal display precision of all elements on a page in bulk, on the page edit dialogue.
- Brushed samples are now highlighted on pages. The highlight shows on the row header, and modifies the colour to show a lower intensity tone of the selected brushing colour.
    - When a sample is shown in visual query this sample is also shown on the page, with the entire row being indicated with a border the colour of the brush colour. This row is scrolled into view, if not in the current view.
- A right click option on pages, when one or more samples are selected, allows the user to manually assign (or de-assign) samples to wells if the linking was not done appropriately on import.
- Right click options on column headers in pages has been improved:
    - Now possible to sort ascending/descending directly from the column header.
    - Help on that property can be obtained from the column header.
    - The property can be added to the properties used as key columns.
    - Edit page and bulk change options added.
- Grids on graphs.
    - Grids are applied to graphs through the Graph Manager layout tab. There are options to apply vertical axis grid lines and horizontal axis grid lines. The availability of these options will depend on the graph type.
- New keyboard shortcuts have been added:
    - F1 – open geochemistry help
    - Ctrl+T – open sort dialogue
    - Ctrl+R – Remove the sort
    - Ctrl+G – open Graph manager
    - Ctrl+Q – open visual Query tool
    - Ctrl+B – change to Brush mode in graphs and maps
    - Ctrl+L – to clear the brushed set in graphs and maps
    - Ctrl+P – to change to Pan-zoom mode in graphs and maps

- Tooltips on the main toolbar, and across the application have been updated to include keyboard shortcuts.
- Importing linking templates will now skip and exclude unrecognised properties. This will allow the user to apply import linking templates created in a more recent version of the software when using an older version. This will also mean that import linking templates will still work if properties they contain have been removed from the property model.
    - Validation on auto-import has been improved to inform the user if the linking template cannot be applied – unzipping and using manual linking should allow the users to bring the data in.

p:IGI+ specific features

- Project merge has been completely re-written:
    - samples can only merge within the same well, and well criteria can no longer be used in the sample merge dialogue.
    - merge speed and memory usage has been dramatically improved, and will now work within very large projects in a reasonable time.
    - reporting of merge summary data has been made more consistent.
    - a static sample is created automatically for any samples with conflicts, and for any samples which have no merge criteria (if a merge is possible).
- You can now export the PCA component loadings to the clipboard for pasting into other applications, such as Excel, if desired.
- Tooltips have been added to the PCA options to explain their usage.

Metis Transform specific features

- Graphs, palettes, maps and statistics have been added to Transform. It is now possible to visually review your data as you clean it.
    - Brushing is included to manually select suspicious samples that require investigation in static sample sets.

Metis Discover specific features

- The user can now show all distinct text properties when querying on text strings.

Fixes

- Changes to the equation system allow us to prefer to use one property as in input if it has a value, otherwise to fallback on another property. This has resulted in some changes (improvements) to the property model (see below).
- A small, but unnecessary margin on legends, which was present on copying has been removed.
- Base folders for Statistics and PCA artefacts have been added to the default new project.
- Errors when creating, and deleting samples after a merge, with sort applied in pages have been fixed.

Property model changes

- Equations updated for properties using TOC. Equations used to use TOC.Any, but this could erroneously include extracted TOC's with unextracted data, or unextracted TOC's with extracted data in rarely occurring situations. The equations have been

revised for HI, OI, OSI across all Pyrolysis groups, and related properties in the Pyrol6 analysis group: Sh-OSI, OIco2 and OIco. The revisions mean the TOC from that analysis group is used if present, but if missing the unextracted or extracted version of Leco measured TOC is used in the unextracted and extracted analyses respectively. Outside of this the equation will not evaluate.

- The lithological description of the sample has been moved from the Geol property group, to the Phys property group. The Geol property group now contains the assigned sample stratigraphy data only.
    - Metadata properties have been removed from the Geol analysis group as the information stored here is not primarily analytically derived.
- A third stratigraphic scheme has been added to capture reported litho and chronostratigraphic assignments.
    - New stratigraphic .Any properties have been created to pull back available stratigraphic labels whether documented or assigned by companies/national organisations.
- The Location.Any property will now include the Well name, if the Sample.Location or Well.Location properties are missing. This will allow the creation of palettes or sample sets involving both well and non-well locations.
- The gas dryness (C1-C4) equation has been modified to be: C1/∑C1-C4) – it used to be defined as C1/∑C2-C4).
- The default unit for many of the gas associated equations e.g. C1/N2 and C2/C3 has be changed from % to Euc (non-dimensional). This is more appropriate given the interpretive uses of these equations.
- Raw gas properties e.g. H2, C4(i), etc have had their default unit edited from % to ppm. This will assist with data loading and use of data as typically this data is reported in ppm concentration units. This affect properties in all the Gas and MudGas groups.
- New Bulk PVT properties have been added for Ideal GOR and Ideal CGR to allow users to store data associated with the geochemical composition of reservoir fluid assuming a perfect separation of liquids and gas.
- Well type.Well and Origin.Sample have been renamed respectively to Site type.Well and Site type.Sample. This renaming is more consistent with a concept of where samples come from e.g. well or non-well sites.

Known issues

- The “Sitka” font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows.
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To address this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue.

- When using pages, we are aware of an issue when using some 4K resolution displays, that results in being unable to edit values in cells. This appears to be a Windows issue and at present the only solution is to reduce the display resolution.

Installation issues

- Requires .NET framework version 4.8
- On first opening projects there will be delay, as the new and revised equations are calculated in the project. Once saved this will not repeat.

1.27.0.xxx (from 1.22.0.xxx)

New features (p:IGI+ and Transform)

- Performance has been improved across the application and is most noticeable in the project data overview (Pixelmap), export, sorting and more slightly in graphs and other data interactions. Memory usage is lower and more controlled.
- Sort can be applied to .Any properties.
- The toolbar has been changed to add quick access to the project analysis overview (in place of the project data overview).
- Geochemistry help, and property search have been improved to allow an advanced search option enabling user to:
    - Filter on property type: standard, gas, molecular or well properties
    - Filter on property character: text, numeric, other, ratio or equation properties
    - Filter to show only special properties: project properties, .Any properties, or exclude .Any properties
    - Show only those properties with data in the current project.
    - This works in combination with the analysis group and text property search, so can be used for example to search only for molecular properties, which have an equation and are project properties and have data in the project.
    - This can be used in all instances where multiple properties are being search for, e.g. in creating pages, statistics, multi-property graphs, visual query, etc.
- Project properties have been thoroughly overhauled:
    - The creation of project properties has been simplified. Users can choose from the start to create text, standard, molecular or gas properties.
    - A special option to create ratio properties simplifies the user interaction and ensures a common and sensible default unit is selected across all indicators (for gas and molecular properties – also adding the * [any] indicator automatically).
    - Project properties can be added to multiple analysis groups in a single creation step.
        - Only analysis groups containing compatible input properties are presented once an equation has been added.
        - Only properties available in all input analysis groups are shown when adding equations to properties in multiple analysis groups.
    - The creation of project properties occurs inside a progress bar, so the user is aware the system is creating the properties and calculating any equations, stopping the application appearing to freeze.
    - The user can edit the long and short names of project properties after their creation.
    - The user can delete project properties from the system – this will check where the project properties are used and alert the user that these artefacts will be deleted if the project property is deleted from the system.
    - We have improved the handling of project properties in import – if an identically named project property is found in an import linking template this is remapped to the existing project property in the project at import, to ensure we do not duplicate project properties – if the two properties are consistent in terms of indicator, units and ratios. This also works when importing artefact templates.

    - When creating project properties in import, the full name is prefilled in the property selector, but the user still has to select the full property by using the dropdown – we will review this for the next release.
- An about dialogue has been added with information about the version and libraries / open source projects used to support features in p:IGI+ and Transform.

p:IGI+ specific features

- The selection of a well is now optional when creating a new depth plot.
- Right click graph menus have a consistent ordering with graph manager always the first entry.
- The brush colour can be set by the user in the graph settings menu, allowing users to customise the colour used when brushing.
- Multi-depth plots have been added allowing up to 12 tracks to be shown.
    - Autographs have been added for commonly used multi-depth plots.
    - Palettes can be applied to all tracks on a plot (this applies to all tracks).
    - Zoom on multi-depth plots only zooms on the depth axis.
    - Brushing is supported across all tracks.
    - Default graph window size can be set on multi-depth plots.
    - Stratigraphy tops can be shown across all tracks.
    - Each axis on the plot can be individually edited via graph manager.
    - Properties shown can be edited using the add/remove properties option.
    - Bulk update can be used to change analysis, indicator or units across all tracks.
    - Plot can be copied / exported for output to high quality image.
    - Data summary can be shown.
- A single track, multi-property depth plot has been added, allowing uses to show e.g. gas or isotope data for up to 12 properties on the same graph.
    - Autographs have been added for commonly used plots.
    - Added support for underlays, overlays and range underlays.
    - An editable legend is automatically created using a colour palette to show the source of the different properties.
    - Only shape and size palettes can be applied to show other aspects of the data.
    - Zoom is supported as a standard depth plot.
    - Stratigraphy tops can be shown.
    - Brushing is supported.
    - Default graph window size can be set.
    - The two axes (depth and single shared x-axis) can be edited via graph manager.
    - Properties shown can be edited using the add/remove properties option with constraints that they must share a common unit group.
    - Bulk update can be used to change analysis, indicator or units.
    - Plot can be copied / exported for output to high quality image.
    - Data summary can be shown.
- Visual query enhancements including:
    - A keyboard short cut to open visual query at any time (Ctrl+Q).
    - Visual query added to the data menu, and icon replacing the not used ‘new well’ icon on the toolbar.

    - Properties set on visual query are remembered and store in the project, and the unused, disabled save to user settings button has been removed.
    - Use can adjust the indicator, unit and ratio in visual query.
    - Property names are shown as standard and .Any properties and [*] indicators show source of data.
    - Use can create static sample set directly from visual query, and clear the selected set from there too.
- Palettes have had an extensive update:
    - Numeric property palettes can be easily edited to provide irregular bins, with the user having control on being able to split and merge existing bins, reset to regular bins, and directly edit defined bin edges to create exactly the palette they want.
    - Text property palettes can now be updated to include new values
    - Text property palettes can be created and edited using subsets of the data set defined by sample sets, allowing users to create and edit palettes for specific subsets of their project if needed.
    - Counts of numbers of samples in each palette category are provided on editing of text palettes.
    - The show only entries with data option now applies to all palette entries, including unassigned and no data elements, with the user interface changed to make that more clear.
- Data points can be labelled on graphs. The user can select to label the data point with any property in the system
    - Up to 100 points can be labelled; where more are present the user can select, using brushing, to label only a subset of the points, to avoid label clutter.
    - Precision shown on the label can be set for numerical properties.
    - Data labels can be hidden / shown without needing to remove the labels.
    - A legend is added to inform the user of the property used in the labels.
    - The font size can be set for data point labels; it will use the general font family.
- Keyboard shortcuts have been added to graphs to switch between brushing (Ctrl+B) and pan/zoom (Ctrl+P) modes. Ctrl+L is used to clear the brushed set.
- Added PCA capability:
    - PCA training data defined by creation of a page of properties, and a sample set to define the rows (samples) - this data is used to 'train' the PCA model.
    - Options to either remove samples with missing data, or replace with the mean in training.
    - Training process allows the user to name the PCA model (these are artefacts and multiple models can be built in a project).
    - Training the model can either centre the data (correct for the mean) or standardise (correct for the mean and variance). A normalisation option is provided if using raw GC / GCMS data.
    - Once trained the user can review the scree plot (percent variance explained as a function of components retained) and the component loadings plot (the weight of each input property on each principal component).
    - The user can select the number of principal components to retain based on the screen and loading plots – these principal components (scores) are then

automatically created as project properties. These use equations; missing values mean the scores (projection of the data onto the principal components) will not be computed.
    - The PCA models can be saved in the project with a full history of their creation. Newly imported data will be projected onto the principal components
    - The PCA models. and associated project properties for the PC scores can be saved as a template and used in other projects. Missing values in the inputs will result in component scores not being calculated.

Metis Transform specific features

- Project merge and push to Staging are significantly faster due to the removal of provenance capture and processing.

Metis Discover specific features

- The user can now select individual wells or samples to be included in a query via Discover.
- If an error occurs users are now better informed and can report this to IGI more easily.
- Users can apply a shapefile to the Discover view to create a polygon for selecting samples.
- Users can filter the list of analysis groups.
- Users can opt to see analyses and properties in alphabetic order.

Fixes

- A memory problem with the maps has been fixed, and maps now use less memory, and release this once closed.
- When a sample is deleted it will be actually removed from the database the next time the project is opened. This was not working before and caused projects to become slower and slower to save as samples were deleted.
- Brushed data comes to the front on parallel coordinate plots.
- There is no longer any effect on brushing performance when visual query is open.
- Visual query columns set to a sensible default width and do not automatically adjust to entry width.

Property model changes

- Alongside general property model maintenance, which includes adding new properties, adding existing properties to new analysis groups, adding equations to existing properties and adding new property aliases the following are key changes to the property model since the last release:
    - Three new analysis groups have been added to the IGI property model
        - **Diam-GCMS:** Diamondoid properties which come from a specific quantitative Diamondoid analysis runs operated by labs.
        - **FIS-MS:** 25 summary parameters (mix of ratios and raw abundances) that are always reported by FIT (Fluid Inclusion Technology) when conducting FIS (Fluid Inclusion stratigraphy) analysis.
        - **PCA:** where generated principle components from generated PCA models are stored.

- Expanded the properties present in our tandem mass spectrometry analysis groups (GCMS-MS & MRM-GCMS) accommodating properties monitored and quantified by GeoMark across a range of molecular groups. Properties in these groups have been created with their common parent-daughter ion range reported in the description but where the monitored ion range differs in GeoMark reports this is recorded in the relevant Geochem help entry
- Several updates and edits have taken place with respect to our Microscopy and Maturity analysis groups:
  - VR equivalence properties from Bitumen in the MatCalc analysis group have been associated to two published literature equations from Landis & Castano (1995) and Jacob (1989).
  - Relocated the LOM (Level of organic Metamorphism) properties from the K-Colour to the MatCalc analysis group, as LOM is a maturity parameter not founded on a maceral colour but change on coal rank.
  - New text descriptive properties have been added to accompany the top hierarchical level maceral/ palynological properties (Vitrinite, Liptinite, Inertinite, Zooclast) in our VisK-RL and VisK-TL analysis groups.
  - A new TAI property schema has been implemented which recognises the different numerical scales which exist and are reported from different labs. Numerical scale ranges of 1-5, 1-7 and 1-N (where n is a user-specified range stored in the *TAI 1-N Scale property*) are now present in the property model.
- All analyses within the system have been re-ordered to provide a more natural (often typical elution order based for GC data) ordering of the properties in the property help, and property search in both p:IGI+ and Metis.

Known issues

- The “Sitka” font family does not work when copying graphs – it displays fine, but the graphs will not copy correctly. We advise users to not use this font family, which has some known issues in Windows.
- When moving samples between wells in pages, and when deleting wells, the sample well information for samples which change well assignment is not updated dynamically. Closing and opening the page addresses this.
- Scrolling in a page after project merging in Transform with sort and a sample set applied can cause the page to fail. Clear, then re-apply the sort to address this.
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To solve this save the project, close p:IGI+, restart, and open the project. We are still exploring the issue here.

Installation issues

- None

1.22.0.1 (from 1.21.0.2)

New features (p:IGI+ and Transform)

- Added the ability to export all well information from a project, so that it can be shared with other projects. This uses a format for the data that allows the user to export all well information from all wells in a project to a single file. This provide a “well manager” like facility in p:IGI+ and Metis Transform.
- Added the ability to bulk import well information from an IGI well file exported from another project, selecting which wells to import (all in project, or all in file) and whether to update all information (overwrite) or only add new information.

p:IGI+ specific features

- Added a completely new map feature. The maps have become an artefact and have the following features:
    - A local toolbar associated with each map artefact to allow control over interaction style, and zooming:
        - zoom to data, set zoom extent manually and save and restore zoom.
    - Show all well and non-well (outcrop, seep, etc) site locations on the map. Well sites are as triangles, non-well sites as squares.
    - Brushing to and from the map is supported.
    - Visual query to highlight samples selected and explore them in more detail.
    - Sample sets can be applied to filter what is shown on the map.
    - Discrete colour palettes (e.g. sample category) can be applied to show either the presence / absence (occupancy) of each class, or a pie chart per site (frequency).
    - Continuous colour and size palettes (e.g. TOC) can be applied to the map to show statistics at each site:
        - the user can select to show a range of statistics.
    - Shapefiles can be applied to the maps, and the file locations will be saved with the map.
    - Shapefiles can be styled as wanted, and attributes shown on hover.
    - The map can be saved as a template to reproduce the same map layout in a different project.
    - The map can be copied with and without legends.
    - Legends can be copied individually if desired.
    - Multiple maps can be made in the project to allow side by side comparison.
    - The default map symbol size can be set in the project.
    - The default map window size can be set.
- Size palettes: sizes are now set using numeric dropdowns to provide better control.
- Size palettes: the unassigned and no data classes are set to sizes smaller than the autofill default smallest size to differentiate them by default.

Metis Transform specific features

- Fixed an issue with merging only well information in the project merge.

Metis Discover specific features

- The user can now export and delete a well and its associated samples from Staging via Discover.
- The user can now select individual wells or samples to be included in a query via Discover.
- The non-well symbol has been changed to a square to be consistent with the new maps in p:IGI+.

Fixes

- Importing dates is more robust from all file types, and dates are stored as text more reliably.
- Invalid values in deviation surveys now prevent the user from attempting to calculate what would be incorrect values.
- Changed the alignment of palette and other legend titles to give a more polished look.
- Fixed a problem with palettes for integer valued properties (number of samples used to calculate the VR mean).
- Fixed a problem when importing special characters in text import (UTF8 encoding).
- Fixed the treatment of special characters in well litho- and chrono-stratigraphy.
- Star plots and parallel coordinate plots which had their indicators or units bulk changed will now open and import from template fine.

Property model changes

- The properties H31DS and H31DR had been incorrectly assigned to the WO and Sat GC analysis groups. They, and associated data, have been moved to the WO and Sat GCMS analysis groups.
- A small number of new isotope (d34S in asphaltene and pyrite) and Spore Colour properties have been added.

Known issues

- When moving samples between wells in pages, and when deleting wells, the sample well information for samples which change well assignment is not updated dynamically. Closing and opening the page addresses this.
- Scrolling in a page after project merging in Transform with sort and a sample set applied can cause the page to fail. Re-apply the sort to address this.
- When a lot of graphs are open at the same time, or after long use of p:IGI+ sometimes you get no points shown on a graph, and a text error message saying “E_OUTOFMEMORY: Ran out of memory (****)”. To solve this save the project, close p:IGI+, restart, and open the project. We are exploring the issue here.

Installation issues

- None.

1.21.0.2 (from 1.19.0.10)

New features (p:IGI+ and Transform)

- We have added the Project Analysis Overview (PAO). Like the Project Data Overview (Pixelmap) this shows where you have data in your project, but on a per analysis basis, supporting our enhanced property model.
    - By default the “project” view shows in which analyses (and for molecular and gas data, in which indicator) you have data in your project in any of the samples.
    - The “well” view shows you which analyses (and indicators) have data in your project, with a row per well.
    - The “sample” view shows which samples have data in which analyses (and indicators).
    - You can apply sample sets to filter what is shown
- Export from p:IGI+ and Metis transform has been enhanced. The user interaction is simpler and more intuitive, and a number of issues have been fixed (export to locked files, behaviour if the file location becomes invalid during export, e.g. USB unplugged, network dropped).
    - Users can select whether to export Any properties as is, or expanded, when exporting data from a (set of) page(s).
    - Linking templates are only generated if expanding the Any properties (this is the default option, which allows re-import into p:IGI+ / Transform).
    - When saving with a linking template the export is now written to a zip file containing the exported data in a text file and the linking template in a json file. This zip file can be dropped onto p:IGI+ / Transform and will be auto-imported, as exports from Metis Discover are.
- Dynamic sample sets can be exported and re-imported as templates, so you can share dynamic sample sets.
- Artefacts can be cloned in the artefact manager to make copies, which can then be edited separately.
- You can bulk import well data from Excel, with control over whether to update or retain existing data, and create new wells, or only process existing wells.

p:IGI+ specific features

- Star plots have been added as a graph type. The user can define the properties to be used on creation and modify this using graph manager.
    - Adding and editing of properties is possible.
    - Bulk change of analyses, indicators and units is available on right click.
    - Layout options enable the user to configure the plot.
    - Palettes and sample sets can be applied to filter and decorate the data.
    - There is a full integration with graph manager to brush, edit the axes and control what is shown, and set the size of the inner radius.
    - New autographs have been added.
- The default symbol, size and colour used on plots can be set in the graph settings dialogue.
- All graphs now have the ability to show a data summary, which gives information on the number of samples shown (and hidden by palettes) on the graph, the number of samples out of range, the sample set(s) applied and the project information.

    - The user can customise the data shown using the graph settings dialogue, both in terms of what is shown and what font is used to show it.
    - The graph summary can be copied independently of the graph as its own entity.
- Graph manager has been enhanced to provide a number of visual refinements.
    - It is now possible to edit the names of axes on Triplots using the Axes tab on graph manager.
- Graphs can be copied using Ctrl-C.
- Legend groups can be copied individually, or as a whole.
- The presentation of axis labels on graphs has been improved so these are no longer clipped.
- Deselecting an overlay layer in graph manager also hides the associated legend.
- Hidden stacks on a histogram are no longer shown as transparent bars, making these consistent with other graph types.

Metis Transform specific features

- Staging merge:
    - The properties used for matching and scoring data on Staging have been extended as described at https://www.igiltd.com/software/igi-software-user-guides/metis-transform-user-guide/metis-staging-wizard/matching-and-scoring-properties.
    - Calculated values are now automatically preferred over given values when merging.
    - Properties are now always displayed in a natural and consistent order.
    - A dialog now appears when no data in the project can be uploaded to Staging. This includes when samples have insufficient properties to be merged with Staging.
    - Wells or samples with no matching properties are excluded from the Staging merge wizard and cannot be uploaded to Staging.
    - Properties used as part of the matching and scoring process are now highlighted in bold.
    - Staging merge can now upload well only data or sample only data, previously both well and sample data were required to complete the process.
    - We have improved the performance of merging data with Staging database.
    - Added a context menu on right click for samples that allows multiple samples to be changed to “New”, “Don’t Merge”, “Merge”, “Select project values” and “Select staging values”.
    - When a conflict is present between Project and Staging values icons are now displayed alongside their respective values to highlight the source of the data.
- Project merge:
    - Improved the performance when merging data.

Metis Discover specific features

- The clustering of well and non-well locations can now be configured directly from the map. The cluster size is saved between sessions.
- The map now uses a larger proportion of the screen when Discover is loaded.
- Added the ability to easily clear text strings when searching for analyses or properties.
- Reduced the amount of data Discover needs to load, improving responsiveness.
- The software version number and domain model number is now shown in the settings dialog.

- A count of well and non-well locations is now shown for the polygon expression rather than a full list of names.
- Up to 1,000 samples at a time can be deleted from Staging via Discover.
- Pre-defined country polygons can be created from the Map tool-bar.

Fixes

- We have fixed p:IGI+ and Transform slowness when using multiple static sample sets.
- Issues with removed Any properties have been addressed, meaning that removed Any properties can still be shown where they were previously used, but will not be selectable in the system.
- Fixed an issue where metadata in the Bulk analysis group could not be queried correctly via Discover.
- Fixed an issue storing and retrieving with very large numerical values.
- Fixed an issue in Transform where samples could not be merged across multiple indicators in specific scenarios.
- We have removed unnecessary changes of units made by project merge and thus improved the efficiency of the project merge in Transform. The provenance captured now accurately represents the history of values in non-default units and ratios.

Property model changes

- A range of new properties (~100 new properties) has been added to support data management work and interpretation.
- We have moved some PVT properties into the Bulk-PVT analysis (reservoir and saturation pressure, reservoir temperature).
- We have modified some equations which were previously not correctly defined and ensued these will be correctly recalculated. Affect properties are: Mango K2, 29MAS, 28MAS, 27MAS, St/MAS+TAS, MAS/St+TAS, TAS/St+MAS.
- Edits have been made to remove unneeded properties, and rename existing properties to provide a more consistent nomenclature.
- We have added Andrew Murrays SVA (semi-volatile inorganics) index – see http://petroleumsystem.blogspot.com/2014/10/measuring-maturity-of-hydrocarbon-fluid.html.
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Known issues

- The properties H31DS and H31DR have been incorrectly assigned to the WO and Sat GC analysis groups. In the next release they, and associated data, will be moved to the WO and Sat GCMS analysis groups.
- When moving samples between wells in pages, and by deleting wells, the sample well information for samples which change well assignment is not updated. Closing and opening the page addresses this.
- Scrolling in a page after project merging in Transform with sort and a sample set applied can cause the page to fail. Re-apply the sort to address this.

Installation issues

- None.

1.19.0.10 El Dorado (from 1.17.0.2)

New features (p:IGI+ and Transform)

- Project files can be dragged onto the application to open a project.
- Text, Excel and p:IGI-3 files can be dragged onto the application to launch the import.
- Template files can be dragged onto the application to create the associated artefact.
- Zip files exported from Metis Discover can be dragged onto the application and will auto-import using the linking template to easily bring data imported from Discover into p:IGI+ or Metis Transform.
- Create a static sample set from a dynamic one to freeze the state at a given time.
- A count of the number of wells imported is provided on the import summary screen.
- The depth model for wells and samples has been simplified. The Kelly Bushing, Drill Floor and Rotary Table datums have been combined, and the data suitably migrated, to a Drillers Reference height datum. It is important to understand this value is the height of the measurement point on the drilling rig above the ground or water surface, and not an absolute elevation above a reference datum (e.g. mean sea level).
    - This change has simplified the datums available for samples, and involved modifications to many artefacts, which are automatically migrated.
- The sample depth datum conversion logic has been changed to assume an onshore well if the Ground Elevation is set. If Water depth is also set a lake / river based well is assumed. If only Water depth is set an offshore well is assumed. The property Onshore?.Well has been renamed Loc Char.Well and now can contain any string, although we suggest using Onshore / Offshore. This property no longer affects depth calculations.
- The import table detection has been improved to work on a larger range of lab exports.
- The harmonise dialogue has been reviewed and simplified to improve usability. Many enhancements have been added:
    - the ability to harmonise only with a sample set / well (auto-selected from the page if one is applied to page);
    - the ability to change the sample set / well being considered on the harmonise dialogue;
    - automatic trimming of leading and trailing white space to ensure data is cleaned effectively, including visual indication of the presence and trimming of white space.
- During import, when the user selects a property manually to link to, it is possible to accept the selected property and move to the next row, auto-selecting the next property in the analysis group.

p:IGI+ specific features

- Autographs have been improved, with 18 new autographs, 2 autographs removed and 8 autographs edited. Of particular note are the following autographs for which the edits are such that interpretations conducted on previous version will need a revision:
    - **Pr/nC17 vs Ph/nC18[*].Any** – Maturity lines, present in the overlay layer, have been adjusted to be equal on both the x & y axis
    - **H29ab/30ab vs H35abS/34abS[*].Any** – Ratio on the x-axis property H30ab/H29ab has been changed from a/b to b/a to correctly fit the environment interpretation regions; which have been coloured and made clearer.

- **Ster/Hop vs t26/t25[*].Any** – The environment underlay interpretation regions have been reversed to correctly fit the format of the Ster/Hop ratio, displayed in a/a+b.
- **H27Ts/H27Tm vs H29Ts/H29ab[*].Any** – The maturity underlay interpretation regions have been adjusted in light of data trends from the IGI compiled UK, OGA released geochemical database. A sample's maturity is equivalent with respect to both axis property ratios. Equivalent VR (Roe)values are given in relation to H27Ts/H27Tm ratio values.
- **IsoheptRat vs HepRat[*].Any** – The kerogen type curves presented in the graphs overlay layer have been adjusted in light of data trends from the IGI compiled UK, OGA released geochemical database.
- **MPR vs MPI-1[*].Any -** The maturity underlay interpretation regions have been adjusted in light of data trends from the IGI compiled UK, OGA released geochemical database. A sample's maturity is equivalent with respect to both axis property ratios. Equivalent VR (Roe)values are given primarily in relation to MPI ratio values (using the %R(MPI<1.35 equation). Autograph name change also changing MPI(1) to MPI-1.

Metis Transform specific features

- In Staging merge and upload, when a project sample matches 100% to a Staging sample, even if there are other (lower percentage) candidates, select the 100% match to merge – conflicts will still be shown.
- In the Staging merge when a Staging sample matches two (or more) project samples, do not propose to merge with any of them (used to be the last one to match was selected).
- The dialogue to select the Metis Staging area (server) to which data should be uploaded has been improved to more clearly show the currently selected server and enable a hyperlink to quickly access the corresponding Metis Discover in your default browser.

Metis Discover specific features

- The user can select which subset of analyses to export from Metis Discover, reducing export times and improving the ability of the user to obtain the data desired, including the ability to select all analyses for export.
- Map always shows all well and sample locations on load.
- Various minor bug fixes, in particular improved property selection.
- User interaction with property selection has been improved.
- The export of text files from Metis Discover uses a wrapping symbol to enable import of fields containing column delimiters (tab).
- The properties shown in the data preview can be modified by the user and will be remembered by the web browser.

Fixes

- Improved the performance of export across the software.
- Equations will be calculated for new properties added to the system where the inputs already exist (essential in Metis Staging). This will also write provenance if necessary.
- Statistics calculations corrected for the unassigned group when a palette is applied.
- All location properties are now populated on the well location tab.

- All other well properties are now editable from the well artefact.
- Changing the meaning of the Kelly Bushing Elevation to Kelly Bushing Height had rendered the datum conversion from KB (Kelly Bushing) to e.g. SS (Sediment Surface), and MSL (Mean Sea Level) incorrect for onshore wells. This has been updated, but it is important that users are aware that we use the Drillers Reference *height* (the height above the ground / water surface, and not the absolute elevation above mean sea level). It is possible (but unlikely) that sample depths calculated with respect to SS or MSL could be wrong for onshore wells.
- Entering very (unrealistically!) large values to integer based properties no longer causes the application to crash.
- Column alignment in the Staging upload in Metis Transform is always maintained.
- The results of statistics on the unassigned group from a palette are always correctly calculated.

Property model changes

- A range of new properties (~100 new properties) has been added to support UK OGA data compilation work, and other clients.
    - Thompson gasoline ratios added to the Gasol-GC group along with Mango ring preference ratios added to all appropriate analysis groups.
    - A whole suite of GC-IRMS deuterium isotope ratio properties to compliment the δ13C properties already present.
    - New deuterium isotope ratio properties for the different separation fractions present in the isotope analysis group.
    - A new TAI scheme class: User 1-N scale to accommodate date not captured against a 1-5 scale or 1-7 scale.
    - New sample properties: Description.Sample and Volume.Sample.
- A new Thermal analysis group to allow the storage of raw and corrected temperature data.
- Simplification of the well depth and location type treatment (see datum and related changes above.)

Known issues

- In older projects the Pyrolysis summary page might not open as some of the properties have been removed. To open the page remove the properties S2-OM.Any, PI-OM.Any and Sh-OSI.Any which have been removed from the system.
- Project merge can get slow in Metis Transform when there are static sample sets present. We are working to fix this – to improve project merge performance you will need to delete the static sample sets, save the project, close it and re-open it.

Installation issues

- None.

1.17.0 Deep Valley (composite from 1.14.0.3)

New features (p:IGI+ and Transform)

- If a particular artefact (page, graph, palette, sample set, etc) cannot be read in a project this artefact is skipped, but the rest of the project will open fine. The reason for the failure and a copy of the artefact is written to the logs.
- Wells now enable all well properties to be seen and edited. The user interface has been improved and validation added to ensure carriage return are not added to text fields by accident.
- Performance has been improved across the system, in particular where a project contains a large number of sample sets. This is most noticeable when opening pages and importing well level stratigraphy tops.
- Users can now work from files stored on remote / network drives. There is a slight slow down to opening a project due to copying the file over the network, but once working there is no change in performance. Save is slower due to network effects.
- The property order is now set from ig.Share when exporting data and creating the page showing all properties with data. The property order of analysis groups, and lab metadata within the analysis groups has been updated.
- The merge grouping now considers units and their conversion when doing the comparison of properties to create merge groups. This takes into account precision in the comparison.
- It is now possible to apply sample sets, palettes and wells to all **open** artefacts with one action. This can be undone.
- It is possible to remove a given sample set, palette or well from all artefacts to which it is currently applied. This can be undone.
- Create multiple sample sets from a text column. The sample sets will be added to a folder, and action is undoable.
- Row and column headers are highlighted in the spreadsheet for selected cells.
- Bulk update now filters to only show potentially valid indicators, rather than all indicators.
- Users can now provide a base layer to all stratigraphy layers where a top down not ‘close off’ the layer. This is especially important to member level data in lithostratigraphy.
- Stratigraphy layers are now shown in a natural order in well manager, including base layers.
- Export uses the short form of the indicators.
- Geochemistry help has been updated to link more extensively to ig.Net.

p:IGI+ specific features

- More symbols are available in graphs, including half-filled symbols, and the default symbol is now a disc.
- There is better validation feedback around the axis extents meaning that it is now not possible to move the graph (via the mouse, or setting the axes) to ranges that are not able to be supported on computers (this is to do with the precision to which numbers can be represented digitally).
- When changing the axis unit, the graph extent is now also converted to the same units, meaning the graph view does not change.
- The default display size can be set for all graph types in the system to allow consistent copying of graphs for presentation.

- Users can create Line plots, with full interaction including brushing.
- Line plots can be modified and bulk updated.
- Data on Line plots can be normalised per sample choosing from 3 options.
- Users can create Chung plots with interaction.
- Graphs are now copied with transparent backgrounds, giving more flexibility to their display for presentation.
- The source of an .Any property is now shown in the visual query.

Metis Transform specific features

- When two wells are merged the system is correctly notified of all changes this implies, and samples are correctly updated.
- Provenance accurately records the creation of wells from spreadsheet interaction.

Metis Discover specific features

- Improved the performance of the map to handle a large number of locations.
- Improved the performance of queries using polygons on large datasets.
- Improved the performance of export
- Fixed an issue where selecting an analysis group and then searching for a property would not filter the list of properties correctly.
- Fixed an issue preventing users querying using UWI.Well.
- Fixed a minor issue where text properties could retain values selected from other text properties.
- Fixed a minor issue where the add button for text properties would incorrectly become disabled.
- Wells and non-well samples are shown differently on the map.
- Move to Leaflet library for rendering map has enabled more data to be shown.
- Users can select all data on the map using a spatial polygon selection tool, which works across all browsers.
- The performance of querying data in Metis Discover has been improved.
- Discover uses Windows authentication securely.

Fixes

- Sample sets correctly update the selector provided when the property is changed from numeric to text.
- Licence protection no longer slows down the application.
- Overlays now correctly update when ratio changes.
- Overlays only render when they are not ‘too big’ with respect to the graph view (fixes issues with infinities, unit conversions and user zooming).
- Sample sets update on unit changes.
- Graph zooming is now restricted to prevent errors when the user zooms in too far, particularly at large values.
- Importing well data with blank values always assigns the correct values to the correct wells. The well merge in p:IGI+ now works exactly as expected.
- Any properties are now defined using the internal property name, not the short property name, making it possible to more easily create any properties.

- The spreadsheet responds correctly to changing equations which produce infinity and NaN values, and clears the calculation when inputs change.
- Opening graphs when sort is applied is now as fast as when there is no sort.
- Some small fixes to well creation to make sure users do not encounter errors when creating wells with duplicate names or spaces in names.
- Search for properties is more robust and will always return many results.
- Search for properties will convert special characters earlier in the pipeline, e.g. alpha to a, superscript to number - helps with linking.
- Renaming a sample set / well now updates the name on any artefact windows to which it is applied.
- Can now harmonise well properties effectively.
- Can no longer harmonise Any properties - this should never have been possible!
- Histogram bars are now exactly filled by the fill colour and have an outline around each element.
- Visual query highlight is always shown correctly on all graphs, even when just opened.
- Equations do not show the results when dividing by zero, but ratios can be correctly converted if a normalised form is shown.
- Lithostrat and chronostrat is always assigned correctly to samples (the Unknown level is now the lowest level in the hierarchy where it was the highest).
- Property names in graph manager are now using the standard display format.
- Import linking screen now correctly clears highlighted columns.
- Exporting a subset of the data by selected a sample set is much faster.
- Pressing 'Esc' now clears the search in artefact manager.
- The artefact tree correctly shows when dynamic and static sample sets are applied (only one can be applied at any time)
- Key column counts are always correct for the given page they are shown on, and any sample set / well applied.

Property model changes

- A range of new properties (~200 new properties) has been added to support UK OGA data compilation work and other clients.

Known issues

- In older projects the Pyrolysis summary page might not open as some of the properties have been removed. To open the page remove the properties S2-OM.Any, PI-OM.Any and Sh-OSI.Any which have been removed from the system.
- Entering very (unrealistically!) large values to integer based properties causes the application to crash.

Installation issues

- None.

1.17.0 Deep Valley

New features

- If a particular artefact (page, graph, palette, sample set, etc) cannot be read in a project this artefact is skipped, but the rest of the project will open fine. The reason for the failure and a copy of the artefact is written to the logs.
- Wells now enable all well properties to be seen and edited. The user interface has been improved and validation added to ensure carriage return are not added to text fields by accident.
- Performance has been improved across the system, in particular where a project contains a large number of sample sets. This is most noticeable when opening pages and importing well level stratigraphy tops.
- Export uses the short form of the indicators.
- Geochemistry help has been updated to link more extensively to ig.Net.

p:IGI+ specific features

- More symbols are available in graphs, including half-filled symbols, and the default symbol is now a disc.
- There is better validation feedback around the axis extents meaning that it is now not possible to move the graph (via the mouse, or setting the axes) to ranges that are not able to be supported on computers (this is to do with the precision to which numbers can be represented digitally).

Metis Transform specific features

Metis Discover specific features

- Improved the performance of the map to handle large quantities of locations.
- Improved the performance of queries using polygons on large datasets.
- *Improved the performance of export*
- Fixed an issue where selecting an analysis group and then searching for a property would not filter the list of properties correctly.
- *Fixed an issue preventing users querying using UWI.Well.*
- Fixed a minor issue where text properties could retain values selected from other text properties.
- *Fixed a minor issue where the add button for text properties would incorrectly become disabled.*

Fixes

- Sample sets correctly update the selector provided when the property is changed from numeric to text.
- Licence protection no longer slows down the application.
- Import linking screen now correctly clears highlighted columns.
- Exporting a subset of the data by selected a sample set is much faster.

- Pressing ‘Esc’ now clears the search in artefact manager.
- The artefact tree correctly shows when dynamic and static sample sets are applied (only one can be applied at any time)
- Key column counts are always correct for the given page they are shown on, and any sample set / well applied.

Property model changes

- A range of new properties (~70 new properties) has been added to support UK OGA data compilation work and other clients.

Known issues

- In older projects the Pyrolysis summary page might not open as some of the properties have been removed. To open the page remove the properties S2-OM.Any, PI-OM.Any and Sh-OSI.Any which have been removed from the system.
- Entering very (unrealistically!) large values to integer properties causes the application to crash.

Installation issues

- None.

1.16.0 Cuba Libre

New features

- Users can now work from files stored on remote / network drives. There is a slight slow down to opening a project due to copying the file over the network, but once working there is no change in performance. Save is slower due to network effects.
- The property order is now set from ig.Share when exporting data and creating the page showing all properties with data. The property order of analysis groups, and lab metadata within the analysis groups has been updated.
- The merge grouping now considers units and their conversion when doing the comparison of properties to create merge groups. This takes into account precision in the comparison.
- It is now possible to apply sample sets, palettes and wells to all open artefacts. This can be undone.
- It is possible to remove a given sample set, palette or well from all artefacts to which it is currently applied. This can be undone.

p:IGI+ specific features

- When changing the axis unit, the graph extent is now also converted to the same units, meaning the graph view does not change.

Metis Transform specific features

- When two wells are merged the system is correctly notified of all changes this implies, and samples are correctly updated.

Metis Discover specific features

- Wells and non-well samples are shown differently on the map.
- Move to Leaflet library for rendering map has enabled more data to be shown.

Fixes

- Overlays now correctly update when ratio changes.
- Overlays only render when they are not ‘too big’ with respect to the graph view (fixes issues with infinities, unit conversions and user zooming).
- Sample sets update on unit changes.
- Graph zooming is now restricted to prevent errors when the user zooms in too far, particularly at large values.
- Importing well data with blank values always assigns the correct values to the correct wells. The well merge in p:IGI+ now works exactly as expected.
- Any properties are now defined using the internal property name, not the short property name, making it possible to more easily create any properties.
- The spreadsheet responds correctly to changing equations which produce infinity and NaN values, and clears the calculation when inputs change.
- Opening graphs when sort is applied is now as fast as when there is no sort.
- Some small fixes to well creation to make sure users do not encounter errors when creating wells with duplicate names or spaces in names.

Property model changes

- A range of new properties (~70 new properties) has been added to support UK OGA data compilation work.

Known issues

- In older projects the Pyrolysis summary page might not open as some of the properties have been removed. To open the page remove the properties S2-OM.Any, PI-OM.Any and Sh-OSI.Any which have been removed from the system.
- Entering very (unrealistically!) large values to integer based properties causes the application to crash.

Installation issues

- ?

1.15.0 Bloody Mary

New features

- Create multiple sample sets from a text column. The sample sets will be added to a folder, and action is undoable.
- Row and column headers are highlighted in the spreadsheet for selected cells.
- Bulk update now filters to only show potentially valid indicators, rather than all indicators.
- Users can now provide a base layer to all stratigraphy layers where a top down not 'close off' the layer. This is especially important to member level data in lithostratigraphy.
- Stratigraphy layers are now shown in a natural order in well manager, including base layers.

p:IGI+ specific features

- The default display size can be set for all graph types in the system to allow consistent copying of graphs for presentation.
- Users can create Line plots, with full interaction including brushing.
- Line plots can be modified and bulk updated.
- Data on Line plots can be normalised per sample.
- Users can create Chung plots with interaction.
- Graphs are now copied with transparent backgrounds, giving more flexibility to their display for presentation.
- The source of an .Any property is now shown in the visual query.

Metis Transform specific features

- Provenance accurately records the creation of wells from spreadsheet interaction.

Metis Discover specific features

- Users can select all data on the map using a spatial polygon selection tool, which works across all browsers.
- The performance of querying data in Metis Discover has been improved.
- Discover uses Windows authentication securely.

Fixes

- Interaction with the spreadsheet has been fixed when the page is docked in the workspace.
- The interaction with codelist cells in the spreadsheet has been fixed, particularly in the bottom cell on a page.
- Equation are evaluated more efficiently on import, controlling memory use better.
- Sample sets now query more quickly.

Property model changes

- Alternative lat, lon coordinates can be provided for samples and wells.

Known issues

- In older projects the Pyrolysis summary page might not open as some of the properties have been removed. To open the page remove the properties S2-OM.Any, PI-OM.Any and Sh-OSI.Any which have been removed from the system.
- Graphs - zooming into some overlays / changing units can cause a crash. We are aware that for some graphs if you zoom in a massive amount this can cause overlays to draw slowly and the application to become unresponsive, and eventually crash. This can also occur when changing units, as this can act like a single large scale zoom. We are working on a fix for this.

- Metis Transform project merge does not convert units when attempting to merge samples, so depths in feet and meters would be incorrectly merged if care is not taken.
- Entering very (unrealistically!) large values to integer based properties causes the application to crash.
- Working on network drives will not currently work unless they are mapped to a local drive. There has been a long standing issue with working on network drives and we are planning to address this.

Installation issues

- Changes to the command line running of p:IGI+ and Metis Transform means the use of commands changes from \command to --command. This will affect the auto-import feature in particular.
- Changes to the way we build the application mean it should now be possible to check out licences for p:IGI+ and Metis Transform (check this is true!?)

1.14.0

New features

- New project now opens more quickly, and older projects are updated to the latest database automatically (this might make the first open a bit slower, so save a new copy to speed up opening times).
- Tie points to enable Measured Depth (MP) -> True Vertical Depth (TVD) conversion can be bulk imported from Excel files for multiple wells in a project.
- The first tab on well manager has been renamed from "Common" to "Well Info".
- The mud type has been added to the well "Drilling" tab.
- Artefacts (graphs, pages, project data overview and statistics) can be docked in the workspace by dragging on to the workspace. Double click opens in a separate child window.
- Sample sets, palettes and wells can be applied to docked artefacts. They are shown in the docked contents header.
- Ion channels can be used to search for molecular properties with ion channel information populated.
- Ion channels can also be included in the property headers and will be used in import linking / property search.

p:IGI+ specific features

- The font family and size can be set for all graphs.
- Brushing has been enabled on histograms, both to and from.
- Brushing has been enabled on parallel coordinate plots, both to and from.

Metis Transform specific features

- Provenance is automatically captured in the project, and is maintained when the data is uploaded to Staging.
- The performance of the upload of data to Staging has been improved.
- Comments and other strings (without codelists associated with them) can be as long as the user wants. Codelist strings are limited to 420 characters.
- Project merge will not split out candidate and project samples when both have one empty merge criterion.

Metis Discover specific features

- Users can select all data on the map using a spatial polygon selection tool.
- Can now see both wells and "non-well" (e.g. outcrop) samples on the map.
- Exporting data has been partially optimised to improve usability.
- Sample sets for finding text properties are now case sensitive, allowing all data to be found.
- A "clear all" button has been added for easier user interaction.
- Updated Discover to work on Microsoft Edge.

Fixes

- Search for properties is more robust and will always return many results.
- Search for properties will convert special characters earlier in the pipeline, e.g. alpha to a, superscript to number - helps with linking.

- Renaming a sample set / well now updates the name on any artefact windows to which it is applied.
- Can now harmonise well properties effectively.
- Can no longer harmonise Any properties - this should never have been possible!
- Histogram bars are now exactly filled by the fill colour and have an outline around each element.
- Visual query highlight is always shown correctly on all graphs, even when just opened.
- Equations do not show the results when dividing by zero, but ratios can be correctly converted if a normalised form is shown.
- Lithostrat and chronostrat is always assigned correctly to samples (the Unknown level is now the lowest level in the hierarchy where it was the highest).
- Property names in graph manager are now using the standard display format.

Property model changes

- The sample type classification has been updated to allow a complete description of the sample.
- Any properties have been added for all location properties to allow users to easily find all samples in a region.
- TOC-Extr.Any has been added that prefers extracted measurements over unextracted data, which is preferred in TOC.Any.
- A range of new molecular properties have been added to WO-GCMS, Sat-GCMS and Arom-GCMS analysis groups.
- New gas analyses groups have been added to store headspace, occluded and adsorbed gas, as well as the sum of these.
- New Py-GC_Extr analysis group has been added to provide bulk pyrolysis GC data from extracted samples.
- The default order of analysis groups reflects the new analysis groups.
- New historical ID properties have been added for wells and samples to allow storage of data id in previous databases.
- MinC added to the PyrolUn and PyrolUn-Extr analysis groups
- User 1 vitrinite reflectance added to Any vitrinite reflectance properties.

Known issues

- In older projects the Pyrolysis summary page might might not open as some of the properties have been removed. To open the page remove the properties S2-OM.Any, PI-OM.Any and Sh-OSI.Any which have been removed from the system.
- Graphs - zooming into some overlays / changing units can cause a crash. We are aware that for some graphs if you zoom in a massive amount this can cause overlays to draw slowly and the application to become unresponsive, and eventually crash. This can also occur when changing units, as this can act like a single large scale zoom. We are working on a fix for this.
- Metis Transform project merge does not convert units when attempting to merge samples, so depths in feet and meters would be incorrectly merged if care is not taken.
- Entering very (unrealistically!) large values to integer based properties causes the application to crash.

- Working on network drives will not currently work unless they are mapped to a local drive. There has been a long standing issue with working on network drives and we are planning to address this.

Installation issues

1.13.0

Fixes:

- Exporting data with a sample set from p:IGI+ or Transform now filters data correctly.
- Fixed an issue where p:IGI+ or Transform could not be closed if an error occurred when loading a project.
- Fixed an issue where specific VR properties would cause the Staging Wizard to crash.
- Fixed an issue where integer properties did not display out of range data correctly.
- Fixed an issue on import where the ion channel row did not account for excluded columns correctly.
- Fixed an issue in spreadsheet where properties with a codelist could not be edited correctly.
- Fixed an issue when importing very large files (150k+ rows) could cause the software to crash.
- Fixed an issue where journals would not get written properly in certain circumstances.
- Fixed an issue where codelist properties code not be edited correctly.
- Fixed an issue where unassigned palette entries did not work correctly in statistics.
- Fixed an issue with equations not being calculated for properties with apostrophes correctly.
- Fixed an issue in Discover where wells would be duplicated on the map if a subset of samples are within the filter.
- Fixed an issue where Export would complete correctly in Internet Explorer.
- Fixed an issue that caused importing and exporting data to be slow in p:IGI+ and Metis Transform.
- Fixed an issue where Discover could intermittently fail to load upon opening. If this issue reoccurs refreshing the web page will load Discover successfully.
- Fixed an issue where editing a well name via the spreadsheet created an invalid. Editing a well name will create a new candidate well that must be merged before being uploaded to staging.
- Fixed an issue in Transform when merging data while sort is applied caused the software to crash.

Features:

- The default blank project can now be completely customised.
- Transform: Added a sample status property that highlights samples that have been merged and are eligible to be uploaded to staging.
- Metis can be deployed using Windows Authentication restricting the access to Transform and Discover to specific active directory groups.
- Artefacts with a sample set or well applied now display the name of the sample set or well within the title bar.
- Improving the logging system to capture the state of the journal to allow better diagnosis of issues.
- Datums are now assigned when importing data rather than after import. Import should be quicker overall.
- Well equations are now calculated on import.

- Added the option to show a page that has all properties with data in the project - this is available on the New Page dialogue. Note this feature has a potential issue that creating the page can take quite a long time in large projects. Please be patient and allow the page creation to complete before selecting a default page.
- Well data can now be imported into Metis Transform.
- Import now prefers to calculate and store derived values wherever possible. If a property value can be calculated (i.e the necessary inputs are present) the calculated value is used, otherwise the value from the file is used. This helps to better support data being imported again after export.
- SQL server should now support a virtually unlimited number of concurrent users. Server performance will be affected by a high volume of users.

Discover:

- Filtered wells are highlighted on the map in the context of all other wells.
- Added export option that downloads a zip file containing the filtering data and a linking file for easy import into p:IGI+ and Transform.
- Searching for a property uses the same algorithm as p:IGI+ and Transform.
- Allows the use of the “not” keyword in an expression.
- Expression information is now more clearly shown as part of the expression element.
- Wells can selected by drawing a region on the map. Currently non-well samples (i.e outcrops) are not represented on the map and cannot be selected this way.

Property model additions:

- Sample.Repeat
- Sample.Sampling reason
- Added equations for SCI Properties.
- PyrolGSA analysis group added.
- Added new equations for PyrolGC
- Added additional VR properties.
- Added a number of new molecular properties.
- Sample.Mud type
- Added new chronostrat and lithostrat entires.

Existing Issues:

- Text properties uploaded to Staging are limited to having values of up to 60 characters. Longer strings of text cause uploading to staging to fail.
- Provenance is not captured in Metis.
- Discover isn’t currently compatible with Microsoft Edge.

Installation issues:

- We need to remove the Show:PageAllData feature switch option from any deployments