the present technology, the systems is configured to guarantee that when a user copies an experimental protocol, rerunning with new parameters or inputs can be accordingly adjusted and validated.

**[0010]** Another embodiment of the present disclosure relates to programmatically offering sensible default settings for an experiment. The user only needs to specify that which is different. This is not possible if the experiment is not represented in a machine computable form, *e.g.*, free text. Also, the default settings greatly improve ease of use by not forcing user to enter every single parameter an experiment requires. Yet in another embodiment, the experiment is automatically linked to logistical information about materials used in experiment, *e.g.*, age of stock solution used.

**[0011]** Another advantage of certain embodiments of the technology is that the analysis module can automatically understand output of the experiment, because in specifying experiment up front the system is contextually aware of definition of the output.

**[0011a]** In view of the above, according to a first aspect of the present disclosure, there is provided a method comprising: displaying to a user via an interface a plurality of experiment types; selecting an experiment type; determining a respective value for each one of a plurality of experimental parameters associated with the experiment type, the determining comprising: setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters; modifying, without an input by the user, the default values of the experimental parameter and the second experimental parameter; receiving data resulting from performing an experiment using the respective modified values of the experimental parameter and the second experimental parameter; and storing the data resulting from performing the experiment, the storing of the data comprising storing the respective value for at least a subset of the plurality of experimental parameters, the subset comprising: at least one parameter selected from information about the sample used in performing the experiment, the information comprising information about source materials, information about processes involved in creating the sample, and previous experiments in which the sample has been used; and at least one parameter selected from a volume, a concentration, a pH, a chemical composition, and a physical location of the sample.

**[0011b]** According to a second aspect of the present disclosure, there is provided a non-transitory computer-accessible storage medium have program instructions stored therein that, in response to execution by a computer system including one or more computers, cause the computer system to perform operations including: displaying to a user via an interface a plurality of experiment types; selecting an experiment type; determining a respective value for each one of a plurality of experimental parameters associated with the at least one experiment type, the determining comprising: setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters; modifying, without an input by the user, the default values of the experimental parameter and the second experimental parameter; receiving data resulting from performing an experiment using the respective modified values of the experimental parameter and the second experimental parameter; and storing the data resulting from performing the experiment, the storing of the data comprising storing the respective value for at least a subset of the plurality of experimental parameters, the subset comprising: at least one parameter selected from the group consisting of information about the sample used in performing the experiment, the information comprising information about source materials, information about processes involved in creating the sample, and previous experiments in which the sample has been used; and at least one parameter selected from the group consisting of a volume, a concentration, a pH, a chemical composition, and a physical location of the sample.

**[0011c]** According to a third aspect of the present disclosure, there is provided a system comprising: one or more memories configured to store instructions; and one or more processors configured to receive instructions from the one or more memories and execute the instructions to cause the system to perform operations including: displaying to a user via an interface a plurality of experiment types; selecting an experiment type; determining a respective value for each one of a plurality of experimental parameters associated with the experiment type, the determining comprising: setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters; modifying, without an input by the user, the default values of the experimental parameter and the second experimental parameter; receiving data resulting from performing an experiment using the respective modified values of the experimental parameter and the second experimental parameter; and storing the data resulting from performing the experiment, the storing of the data comprising storing the respective

value for at least a subset of the plurality of experimental parameters, the subset comprising: at least one parameter selected from the group consisting of information about the sample used in performing the experiment, the information comprising information about source materials, information about processes involved in creating the sample, and previous experiments in which the sample has been used; and at least one parameter selected from the group consisting of a volume, a concentration, a pH, a chemical composition, and a physical location of the sample.

**[0011d]** According to a forth aspect of the present disclosure, there is provided a method comprising: receiving first data from a first remote computer, wherein the data includes an experiment type and a plurality of experimental parameters associated with the experiment type; setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters; modifying, without an input by the user, the default value of the experimental parameter and the second experimental parameter; the modification of the default value comprising: selecting an instrument of a plurality of instruments based on a value of at least one experimental parameter of the plurality of experimental parameters; calibrating the instrument periodically; and adjusting the default value of the experimental parameter or the second experimental parameter based on a result from the calibration of the instrument performing an experiment using the modified values of the experimental parameter and the second experimental parameter; and transmitting second data to a second remote computer, wherein the second data is indicative of results generated by performing the experiment.

**[0011e]** According to a fifth aspect of the present disclosure, there is provided a method comprising: displaying to a user via an interface a plurality of experiment types; selecting, using the interface, a first experiment type; determining a respective value for each one of a plurality of experimental parameters associated with the first experiment type scheduling a first experiment using the first experiment type to be performed at a first time; receiving at least one result from performing the first experiment using the respective values for each experimental parameter of the plurality of experimental parameters; dynamically altering generated instructions to perform the first experiment based on the at least one result from the first experiment; storing the at least one result from performing the first experiment selecting, using the interface, a second experiment type, wherein the second experiment type specifies the at least one result from the first experiment; scheduling a second experiment using the

second experiment type to be performed at a second time, wherein the second time occurs after the first experiment has been completed; and in response to performing the second experiment, linking, in a database, results, images, metadata, and reagents of the first experiment with results, images, metadata, and reagents of the second experiment.

**[0011f]** According to a sixth aspect of the present disclosure, there is provided a non-transitory computer-accessible storage medium having program instructions stored therein that, in response to execution by a computer system including one or more computers, cause the computer system to perform operations including: displaying to a user via an interface a plurality of experiment types; selecting, using the interface, a first experiment type; determining a respective value for each one of a plurality of experimental parameters associated with the first experiment type; scheduling a first experiment using the first experiment type to be performed at a first time; receiving at least one result from performing the first experiment using the respective values for each experimental parameter of the plurality of experimental parameters; dynamically altering generated instructions to perform the first experiment based on the at least one result from the first experiment; storing the at least one result from performing the first experiment selecting, using the interface, a second experiment type, wherein the second experiment type specifies the at least one result from the first experiment; scheduling a second experiment using the second experiment type to be performed at a second time, wherein the second time occurs after the first experiment has been completed; and in response to performing the second experiment, linking, in a database, results, images, metadata, and reagents of the first experiment with results, images, metadata, and reagents of the second experiment.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]** The figures of the accompanying drawings describe provided embodiments by way of illustration only, in which:

**[0013]** FIG. 1 shows a user interface for selecting an experiment type to be run on a system of the present disclosure;

**[0014]** FIG. 2 shows that the user, after selecting an experiment type, is presented with an interface to choose samples;

**[0015]** FIG. 3 shows an interface for the user to choose samples to be run in an experiment;

**[0016]** FIG. 4 shows that the samples are chosen for the experiment;

**[0017]** FIG. 5 shows a user interface that allows the user to adjust experimental parameters;

**[0018]** FIG. 6A shows that certain experimental parameters have been adjusted by the user;

**[0019]** FIG. 6B shows that, upon evaluating the entered value for the parameter, a warning is given by the system;

## CLAIMS

1. A method, comprising:

displaying to a user via an interface a plurality of experiment types;

selecting an experiment type;

determining a respective value for each one of a plurality of experimental parameters associated with the experiment type, the determining comprising:

setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters;

modifying, without an input by the user, the default values of the experimental parameter and the second experimental parameter;

receiving data resulting from performing an experiment using the respective modified values of the experimental parameter and the second experimental parameter; and

storing the data resulting from performing the experiment, the storing of the data comprising storing the respective value for at least a subset of the plurality of experimental parameters, the subset comprising:

at least one parameter selected from information about the sample used in performing the experiment, the information comprising information about source materials, information about processes involved in creating the sample, and previous experiments in which the sample has been used; and

at least one parameter selected from a volume, a concentration, a pH, a chemical composition, and a physical location of the sample.

2. The method of claim 1, wherein determining the respective value for each one of the plurality of experimental parameters further includes setting a default value for each one of the plurality of experimental parameters.

3. The method of claim 2, further comprising modifying a default value of a third experimental parameter based on a user input received via the interface to generate an updated value of the third experimental parameter.

4. The method of claim 3, further comprising modifying a default value of a fourth experimental parameter of the plurality of experimental parameters based on the updated value of the third experimental parameter.

5. The method of claim 2, further comprising prompting a user for an initial value of a particular experimental parameter, and receiving the initial value via the interface.

6. The method of claim 5, further comprising modifying a default value of another experimental parameter of the plurality of experimental parameters based on the initial value of the particular experiment parameter.

7. The method of claim 1, wherein at least one experimental parameter of the plurality of experimental parameters specifies a desired experimental result of the experiment; and

the selecting an experiment type, determining a respective value, receiving data, and storing the data are pre-programmed and conducted without an input by the user.

8. The method of claim 1, wherein at least one experimental parameter of the plurality of experimental parameters specifies a sample to be used in performing the experiment, and further comprising:

placing, into a queue, a protocol object representing the experiment, the sample, and previous instructions used to perform the experiment, to direct and coordinate a production of a new physical sample and a sample object representing the new physical sample;

in response to the experiment being performed, removing the protocol object from the queue and generating updated instructions to perform the experiment;

linking the generated updated instructions to the sample, the plurality of experimental parameters, sensors, and tracking devices; and

dynamically altering the generated updated instructions in response to changes in the sample, the plurality of experimental parameters, the sensors, and the tracking devices.

9. The method of claim 1, wherein at least one experimental parameter of the plurality of experimental parameters specifies an instrument to be used in performing the experiment, and further comprising:

determining and saving parameters specifying conditions of preparation, calibration, shutdown, and clean up of the instrument; and

linking the determined and saved parameters to the experiment.

10. A non-transitory computer-accessible storage medium have program instructions stored therein that, in response to execution by a computer system

including one or more computers, cause the computer system to perform operations including:

displaying to a user via an interface a plurality of experiment types;

selecting an experiment type;

determining a respective value for each one of a plurality of experimental parameters associated with the at least one experiment type, the determining comprising:

setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters;

modifying, without an input by the user, the default values of the experimental parameter and the second experimental parameter;

receiving data resulting from performing an experiment using the respective modified values of the experimental parameter and the second experimental parameter; and

storing the data resulting from performing the experiment, the storing of the data comprising storing the respective value for at least a subset of the plurality of experimental parameters, the subset comprising:

at least one parameter selected from the group consisting of information about the sample used in performing the experiment, the information comprising information about source materials, information about processes involved in creating the sample, and previous experiments in which the sample has been used; and

at least one parameter selected from the group consisting of a volume, a concentration, a pH, a chemical composition, and a physical location of the sample.

11. The non-transitory computer-accessible storage medium of claim 10, wherein determining the respective value for each one of the plurality of experimental parameters includes setting a default value for each one of the plurality of experimental parameters.

12. The non-transitory computer-accessible storage medium of claim 10, wherein the operations further include modifying a default value of a third experimental parameter based on user input received via the interface to generate an updated value of the third experimental parameter.

13. The non-transitory computer-accessible storage medium of claim 12, wherein the operations further include modifying a default value of a fourth experimental

parameter of the plurality of experimental parameters based on the updated value of the third experimental parameter.

14. The non-transitory computer-accessible storage medium of claim 10, wherein the operations further include prompting a user for an initial value of a particular experimental parameter, and receiving the initial value via the interface.

15. The non-transitory computer-accessible storage medium of claim 14, wherein the operations further include modifying a default value of another experimental parameter of the plurality of experimental parameters based on the initial value of the particular experiment parameter.

16. The non-transitory computer-accessible storage medium of claim 10, wherein at least one experimental parameter of the plurality of experimental parameters specifies a desired experimental result of the experiment; and

the selecting an experiment type, determining a respective value, receiving data, and storing the data are pre-programmed and conducted without an input by the user.

17. The non-transitory computer-accessible storage medium of claim 10, wherein at least one experimental parameter of the plurality of experimental parameters specifies a sample to be used in performing the experiment; and the operations further include:

placing, into a queue, a protocol object representing the experiment, the sample, and previous instructions used to perform the experiment, to direct and coordinate a production of a new physical sample and a sample object representing the new physical sample;

in response to the experiment being performed, removing the protocol object from the queue and generating updated instructions to perform the experiment;

linking the generated updated instructions to the sample, the plurality of experimental parameters, sensors, and tracking devices; and

dynamically altering the generated updated instructions in response to changes in the sample, the plurality of experimental parameters, the sensors, and the tracking devices.

18. The non-transitory computer-accessible storage medium of claim 10, wherein at least one experimental parameter of the plurality of experimental parameters specifies an instrument to be used in performing the experiment; and the computer program further causes the computer system to perform:

determining and saving parameters specifying conditions of preparation, calibration, shutdown, and clean up of the instrument; and

linking the determined and saved parameters to the experiment.

19. A system, comprising:

one or more memories configured to store instructions; and

one or more processors configured to receive instructions from the one or more memories and execute the instructions to cause the system to perform operations including:

displaying to a user via an interface a plurality of experiment types;

selecting an experiment type;

determining a respective value for each one of a plurality of experimental parameters associated with the experiment type, the determining comprising:

setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters;

modifying, without an input by the user, the default values of the experimental parameter and the second experimental parameter;

receiving data resulting from performing an experiment using the respective modified values of the experimental parameter and the second experimental parameter; and

storing the data resulting from performing the experiment, the storing of the data comprising storing the respective value for at least a subset of the plurality of experimental parameters, the subset comprising:

at least one parameter selected from the group consisting of information about the sample used in performing the experiment, the information comprising information about source materials, information about processes involved in creating the sample, and previous experiments in which the sample has been used; and

at least one parameter selected from the group consisting of a volume, a concentration, a pH, a chemical composition, and a physical location of the sample.

20. The system of claim 19, wherein determining the respective value for each one of the plurality of experimental parameters includes setting a default value for each one of the plurality of experimental parameters.

21. The system of claim 19, wherein the operations further include modifying a default value of a third experimental parameter based on user input received via the interface to generate an updated value of the third experimental parameter.

22. The system of claim 21, further comprising modifying a default value of a fourth experimental parameter of the plurality of experimental parameters based on the updated value of the third experimental parameter.

23. The system of claim 19, further comprising prompting a user for an initial value of a particular experimental parameter, and receiving the initial value via the interface.

24. The system of claim 23, further comprising modifying a default value of another experimental parameter of the plurality of experimental parameters based on the initial value of the particular experiment parameter.

25. The system of claim 20, wherein at least one experimental parameter of the plurality of experimental parameters specifies a desired experimental result of the experiment; and

the selecting an experiment type, determining a respective value, receiving data, and storing the data are pre-programmed and conducted without an input by the user.

26. The system of claim 19, wherein at least one experimental parameter of the plurality of experimental parameters specifies a sample to be used in performing the experiment; and the operations further comprise:

placing, into a queue, a protocol object representing the experiment, the sample, and previous instructions used to perform the experiment, to direct and coordinate a production of a new physical sample and a sample object representing the new physical sample;

in response to the experiment being performed, removing the protocol object from the queue and generating updated instructions to perform the experiment;

linking the generated updated instructions to the sample, the plurality of experimental parameters, sensors, and tracking devices; and

dynamically altering the generated updated instructions in response to changes in the sample, the plurality of experimental parameters, the sensors, and the tracking devices.

27. The system of claim 19, wherein at least one experimental parameter of the plurality of experimental parameters specifies an instrument to be used in performing the experiment; and the operations further comprise:

determining and saving parameters specifying conditions of preparation, calibration, shutdown, and clean up of the instrument; and

linking the determined and saved parameters to the experiment.

28. A method, comprising:

receiving first data from a first remote computer, wherein the data includes an experiment type and a plurality of experimental parameters associated with the experiment type;

setting, without an input by the user, default values of an experimental parameter and a second experimental parameter among the plurality of experimental parameters;

modifying, without an input by the user, the default value of the experimental parameter and the second experimental parameter, the modification of the default value comprising:

selecting an instrument of a plurality of instruments based on a value of at least one experimental parameter of the plurality of experimental parameters;

calibrating the instrument periodically; and

adjusting the default value of the experimental parameter or the second experimental parameter based on a result from the calibration of the instrument;

performing an experiment using the modified values of the experimental parameter and the second experimental parameter; and

transmitting second data to a second remote computer, wherein the second data is indicative of results generated by performing the experiment.

29. The method of claim 28, further comprising selecting at least one sample of a plurality of samples based on a value of at least one experimental parameter of the plurality of experimental parameters.

30. The method of claim 28, wherein at least one experimental parameter of the plurality of experimental parameters specifies a desired experimental result.

31. The method of claim 30, wherein performing the experiment includes making at least a measurement; and

the receiving, resolving, performing, and transmitting are pre-programmed and conducted without an input by the user.

32. The method of claim 31, further comprising determining a value of the desired experimental results using a measurement value resulting from making the at least one measurement.

33. The method of claim 31, further comprising storing a measurement value resulting from making the at least one measurement.

34. The method of claim 33, wherein transmitting the second data to the second remote computer comprises transmitting the measurement value to the second remote computer.

35. The method of claim 28, wherein the second remote computer comprises the first remote computer.

36. A method, comprising:

displaying to a user via an interface a plurality of experiment types;

selecting, using the interface, a first experiment type;

determining a respective value for each one of a plurality of experimental parameters associated with the first experiment type;

scheduling a first experiment using the first experiment type to be performed at a first time;

receiving at least one result from performing the first experiment using the respective values for each experimental parameter of the plurality of experimental parameters;

dynamically altering generated instructions to perform the first experiment based on the at least one result from the first experiment;

storing the at least one result from performing the first experiment;

selecting, using the interface, a second experiment type, wherein the second experiment type specifies the at least one result from the first experiment;

scheduling a second experiment using the second experiment type to be performed at a second time, wherein the second time occurs after the first experiment has been completed; and

in response to performing the second experiment, linking, in a database, results, images, metadata, and reagents of the first experiment with results, images, metadata, and reagents of the second experiment.

37. The method of claim 36, further comprising retrieving the data resulting from performing the first experiment prior to performing the second experiment.

38. A non-transitory computer-accessible storage medium having program instructions stored therein that, in response to execution by a computer system including one or more computers, cause the computer system to perform operations including:

displaying to a user via an interface a plurality of experiment types;

selecting, using the interface, a first experiment type;

determining a respective value for each one of a plurality of experimental parameters associated with the first experiment type;

scheduling a first experiment using the first experiment type to be performed at a first time;

receiving at least one result from performing the first experiment using the respective values for each experimental parameter of the plurality of experimental parameters;

dynamically altering generated instructions to perform the first experiment based on the at least one result from the first experiment;

storing the at least one result from performing the first experiment;

selecting, using the interface, a second experiment type, wherein the second experiment type specifies the at least one result from the first experiment;

scheduling a second experiment using the second experiment type to be performed at a second time, wherein the second time occurs after the first experiment has been completed; and

in response to performing the second experiment, linking, in a database, results, images, metadata, and reagents of the first experiment with results, images, metadata, and reagents of the second experiment.

39. The non-transitory computer-accessible storage medium of claim 38, further comprising retrieving the data resulting from performing the first experiment prior to performing the second experiment.