



rePLANT

Guide for Applicants

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1. THE rePLANT PROGRAMME

1.1 Programme Description

The **rePLANT (Reconstruction Biology in Plant Sciences) Doctoral Training Programme** is an ambitious research and training initiative coordinated by the Centre for Research in Agricultural Genomics (Crag; Barcelona, Spain) together with the Max Planck Institute for Plant Breeding Research (MPIPZ; Cologne, Germany) and the John Innes Centre (JIC; Norwich, UK).

Reconstruction biology leverages current knowledge on plant traits and their underlying genes and molecules to understand trait diversification and innovation in a phylogenetic framework, i.e. within and between related species. rePLANT will conduct reconstruction biology at three levels of biological organisation: cell-free systems, whole organisms and ecosystems. With rePLANT, it is expected to define quantitative trait models and uncover emergent properties, i.e. system features that the individual components do not have, as well as insights into how far a given trait can be diversified without pleiotropic effects.

The rePLANT Programme relay on **6 thematic areas**:

- (1) Plant development and interaction with the environment;
- (2) Plant responses to stress and plant-microbe interactions;
- (3) Plant metabolism and physiology;
- (4) Synthetic and systems biology;
- (5) Computational biology and mathematical modelling; and
- (6) Plant genomics, genetics and breeding.

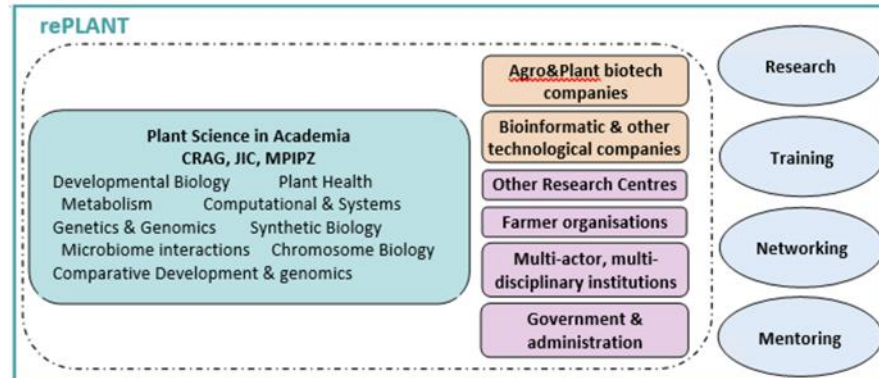
rePLANT is designed to conduct, and train in, interdisciplinary and intersectoral collaborative research projects between the three participating institutions, with the additional collaboration and support of associated partner organisations (private companies, and research centres and academic institutions), both national and international.

rePLANT is an international, interdisciplinary, and intersectoral programme that offers **fourteen (14) four-year doctoral fellowships**. Recruiting entities are **Crag (7 fellowships)** and **MPIPZ (7 fellowships)**. This programme is focused on:

- **Training** in advanced research topics and technologies and training in non-research oriented transferable and transversal skills. rePLANT researchers will enjoy a common training programme in which all rePLANT researchers will have the opportunity to interact with researchers of the three institutions from inside and outside rePLANT.
- **Collaborative research projects and secondments**. This programme will be implemented by collaborative research projects led by researchers at Crag and MPIPZ in close collaboration with JIC's researchers. The alignment, complementarity, and synergy of the research conducted at Crag, JIC and MPIPZ is evidenced by the organisation of their activities into four similar Scientific Programmes (Crag), Research Areas (JIC) or Scientific Departments (MPIPZ). rePLANT fellows will be strongly encouraged to have secondments abroad. Secondments abroad are considered an essential step for fellows to improve the quality of their training. In addition, the collaboration with Associated Partners and mentors will help them to build a strong international network.

- International networking in both the academic and the industrial sectors.** rePLANT has 27 Associated Partners interested in participating in the Programme through the collaboration in research projects, hosting of researchers in secondments, mentoring or training:
 - Agro and plant biotech companies: RZ, Bayer, KWS, Alcaliber, OpenNatur, Vytrus Biotech, Semillas Batlle, Tricopharming, Silicolife, Biotrend, Rústicas del Guadalquivir, and NPZ Innovation.
 - Bioinformatic and other technological companies: Sequentia Biotech, Kumux and Protoqsar.
 - Other research Centres: Institute of Materials Science of Barcelona (ICMAB), Catalan Institute of Nanoscience and Technologies (ICN2), Centre for Mathematical Research (CRM) and International Centre for Numerical Methods in Engineering (CIMNE).
 - Farmer organisations: CrowdFarming
 - Multi-actor, multi-disciplinary, and other institutions: European Technology Platform “Plants for the Future” (Plant ETP), Euroseeds, Barcelona Science & Technology Diplomacy Hub, BAU College of Arts&Design and HFP Consulting.
 - Government & administration: Agriculture and Livestock Department of the Catalan Government.

All in order to enrich the training of the doctoral students and enhance their professional development while conducting projects of research excellence in the area of reconstruction biology in plant sciences.



rePLANT (Reconstruction Biology in Plant Sciences) Doctoral Training Programme structure.

Funding

The rePLANT Postdoctoral Programme has received funding from the European Union’s Horizon Europe research and innovation programme under the Marie Skłodowska-Curie COFUND (Grant Agreement Project: 101081581) and will be co-funded by the Spanish Ministry of Science and Innovation through the “Severo Ochoa” Centres of Excellence and “Maria de Maeztu” Excellence Units Programme 2019 (Project No. CEX2019-000902-S).

1.2 What we offer in the 2nd call

The rePLANT Programme will offer in this second call 4 predoctoral grants at MPIPZ. The rePLANT Doctoral Training Programme offers the possibility for rePLANT researchers to perform highly innovative and multidisciplinary research projects using state-of-the-art facilities within a scientifically-oriented nurturing environment. CROG and MPIPZ, as recruiting institutions, and JIC as implementing partner, will provide rePLANT researchers with additional benefits including:

Local Training

Doctoral researchers at MPIPZ have access to training on site, organised by the MPIPZ Graduate School, to training at the UoC, offered by the departmental Graduate School for Biological Sciences and the university-wide Albertus Magnus Centre for Early Career Researchers, and to training of the Max Planck Society, provided through the Planck Academy. In 2021, predoctoral researchers could choose from a total of 66 workshops and courses, 6 offered at the MPIPZ, 24 by the UoC and 36 by the Planck Academy. These covered a variety of areas, including research skill development (14 courses, e.g. bioinformatics, data processing and visualisation, statistical literacy, imaging and image analysis); science communication (13 courses, e.g. writing and publishing, designing and presenting posters, voice and presentation coaching, science communication and video fundamentals); career navigation inside and outside academia (19 courses); self- and project management (5 courses); mental wellbeing (6 courses); leadership and communication (6 courses); and diversity and bias awareness (3 courses).

Female predoctoral researchers can attend further training in the framework of mentoring programmes available at the UoC and through the Max Planck Society. Several programmes exist that can set a focus on international predoctoral researchers, academic or non-academic career aspirations. These do provide predoctoral researchers with a mentor from a corresponding background, offer an, often annual, training programme to the mentees and create opportunities to network with mentees and mentors from the programme.

JIC will facilitate access to a wide range of training for doctoral researchers students spending research stay at JIC. Most of this is delivered face to face on site and some of it, especially mandatory training around Equality & Diversity, is done online. Some of its training is now also delivered via Zoom where appropriate. The training rePLANT fellows may attend will be with other researchers from the Norwich Research Institutes allowing for them to start building their networks as well. Training is delivered by the in-house training team, internal subject experts (e.g. Bioinformatics) and by bringing in external trainers. In the 2021/22 year more than 50 courses were available to students. Courses are offered in Bioinformatics, Statistical training and platform specific training (e.g. Microscopy). There is also a wide range of training in career development, such as Fellowship workshops, Grant writing and Ethics in Publishing. Alongside this there is a wide range of courses offered in personal development, ranging from Time Management and Productivity, through to Design training, IT training, Communication Skills as well as Leadership training. In addition, JIC has a range of Mental Health and Wellbeing training available to support students further and the in-house training team regularly meets with the Researcher Representative to ensure the training offering meets their needs. If specific courses are required for students, there is also a small budget to fund individual requests to access training outside of the normal offering.

All rePLANT researchers, regardless of their recruiting institution, will have access to the online training activities provided by the Max Planck Society's Planck Academy.

rePLANT training programme

The rePLANT-specific training programme has been organised in two training weeks for all rePLANT researchers to meet together at the same place:

- 1st Training Week (Barcelona)
- 2nd Training Week (Cologne)

This specific programme will offer training on research and transversal skills such as: Bioinformatics & Data analysis, Modelling, Genome Editing, Imaging and Synthetic Biology, Building personal resilience and handling stress, Professional Development and Presentation skills, or Career development, among others.

Mentoring

As part of the programme, rePLANT researchers must have a mentor from a non-academic institution or another discipline. The mentor can be from an organisation participating in the research project, from an associated partner supporting the application, from the alumni networks of any of the implementing institutions or any other institution selected by the fellow.

Secondments

As part of the rePLANT fellows' training in research skills, secondments to the implementing partners or partner organisations will be encouraged to help the fellows networking and to acquire relevant experience. To promote international, intersectoral and/or interdisciplinary secondments, the Programme will provide ample opportunities for secondments for rePLANT fellows. The secondments may last up to 6 months, with a minimum duration of 1 month. The secondment phase can be a single period or be divided into shorter mobility periods and should significantly add to the impact of the fellowship.

Appointment conditions of researchers

	MPIPZ (Cologne, Germany)
Contract	4-year full-time employment contracts
Salary (average €/ year)	35.732 €
Mobility allowance (€/month)*	45€
Family allowance**	100€

*Researchers with residence out of the region where the recruiting institution is located at the time of signing the rePLANT contract will receive a single payment of 2,000 Euros at the beginning of their appointment as relocation allowance.

** In case of family obligations: 1) by marriage; 2) by a relationship with equivalent status to a marriage recognised by the legislation 3) as dependent children. The family status of a researcher will be determined at the date of deadline of the call and will be revised during the lifetime of the action only if fellows change their status in terms of dependent children.

1.3 Who can apply

All applicants fulfilling the eligibility criteria (please consult section 2.3 below) at the time of the call deadline can apply to this programme.

CROG is committed to the principles of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers, and has received the '**Human Resources Excellence in Research**' award from the European Commission. CROG is an equal opportunity / affirmative action

employer and always encourages women and underrepresented minorities to apply. No restrictions on gender, age, ethnic groups, national or social origin, religion or belief, sexual orientation, language, disability, political opinion, and social or economic conditions apply to CRAG positions.

1.4 Host Groups

The Research Groups at MPIPZ participating in the rePLANT call as Host Groups are indicated below:

MPIPZ Host Groups		
Research Area/Group	Principal Investigator/s	e-mail
Underwood - Meiosis in crops	Charles Underwood;	cunderwood@mpipz.mpg.de;
Marques - Evolution of Meiosis	André Marques	amarques@mpipz.mpg.de
Genetic basis of phenotypic evolution	Angela Hay	hay@mpipz.mpg.de
Plant Development and Diversity	Miltos Tsiantis	tsiantis@mpipz.mpg.de
Quantitative approaches to multicellular dynamics in plant development	Pau Formosa-Jordan/George Coupland	pformosa@mpipz.mpg.de

Please **note that a research group can only be awarded with one grant funded under the rePLANT programme**. In case several candidates are shortlisted for the same research group, only the one with higher score will be invited to join the selected institution.

Candidates can only apply to one research group. In case of some vacancy is not covered after the evaluation process or the appointment process, candidates in the reserve list will be invited (in rank order) to join an available vacancy, if any, even if the vacancy corresponds to a different research group than the one the candidate applied to. The Selection Committee will evaluate the suitability for the candidate to join a different research group than the original one.

It is highly recommended to contact the Host Groups to discuss common interests.

1.5 Partner Organisations

At the time of launching this call, there are 27 Associated Partner Organisations interested in participating in the rePLANT Programme by collaborating in the research projects, by providing mentoring to the doctoral researchers and/or by participating in training activities. During the lifetime of the project, CRAG will identify additional Companies and institutions interested in hosting researchers for secondments or to provide training. In addition, rePLANT researchers are free to suggest or bring potential collaborations.

Research Centers

Institute of Materials Science of Barcelona (ICMAB), Catalan Institute of Nanoscience and Technologies (ICN2), Centre for Mathematical Research (CRM) and International Centre for Numerical Methods in Engineering (CIMNE).

Industry

- **Agro and plant biotech companies:** RZ, Bayer, KWS, Alcaliber, OpenNatur, Vytrus Biotech, Semillas Batlle, Tricopharming, Silicolife, Biotrend, Rústicas del Guadalquivir, Planasa, and NPZ Innovation.
- **Bioinformatic and other technological companies:** Sequentia Biotech, Kumux and Protoqsar.

Multi-actor, multi-disciplinary, and other institutions


CrowdFarming, European Technology Platform “Plants for the Future” (Plant ETP), Euroseeds, Barcelona Science & Technology Diplomacy Hub, BAU College of Arts&Design and HFP Consulting, Agriculture and Livestock Department of the Catalan Government.

2. CALL FOR PROPOSALS

2.1 Timeline

- **Publication of the call:** 3rd July, 2023.
- **Deadline call:** August 27th, 2023 at 00:00h CET Time
- **Evaluation and Selection:** September - early October, 2023
- **Expected publication of results:** mid-October, 2023
- **Fellowships start date:** January, 2024

Selection process



Duration		8 weeks	1 week	5 weeks		1 week	10 Days	Up to 3 months
Action	Call Publication	Application	Administrative Eligibility check	Assessment Process	Interviews	Final Ranking	Appointment of Selected Applicants	Recruitment
Outcome	Announcements in different websites, social media, etc.	Nº proposals submitted	Nº eligible proposals	- Evaluation reports - Ranking of applicants - Applicants recommended for Interview	- Evaluation reports - Ranking of applicants	- Final Ranking - Applicants recommended for funding and reserve list	- Invitation letters - Acceptance letters	Hired researchers
Actors	CRAG	Applicants	MPIPZ	Selection Committee	Interview Committee	Interview Committee	MPIPZ/Applicants	MPIPZ

2.2 Application Process

Applications should be submitted through **CRAGjobs**:

<https://recruitment.cragenomica.es/jobs/4-predocdoctoral-fellowships-on-msca-cofund-project-replant-2on-call> , it requires a registration with a password-protected user account.

The application must be complete and include all obligatory information and documents before the deadline of the call. Once the application is submitted, applicants will receive an automatic acknowledgement of receipt. The application can be withdrawn at any time of the selection process.

The application must be complete and include all obligatory information and documents.

When available in the “Documents and Templates” section on the website of the programme, templates must be used. Applicants will need to provide the following information via CRAGjobs:

- 1) **Statement of research interest** (Template available on the website), it should include (3-page limit):
 - a **motivation letter** (1-page limit);
 - a **short comment of the research project proposed by the Host Group of interest** (2-page limit) to be conducted at the contracting institution (MPIPZ). Applicants are required to include elements of interdisciplinarity and/or cross-sectoral collaboration in their research proposal that might include the proposal for collaboration or secondment in JIC or/and Associated Partner;
 - **A short review of one key publication** emerging from the host group of their interest (1 page limit);
- 2) **Curriculum Vitae** (Template available on the website) including the following information: applicant data and research experience; scientific output; fellowships, grants, awards and honours; dissemination and scientific communication activities;
- 3) **Higher education qualifications** (previous Bachelor and official University Master degree or equivalent) **in English**; In case of not providing Master Degree certification, the candidate must include a declaration of compliance with all requirements to access to the doctoral programme at the time of starting the fellowship (Template available in the website).
- 4) **Higher education academic transcripts (transcript of records), ideally in English**;
- 5) **Mobility Declaration** (Template available on the website); and,
- 6) **Ethics Declaration** (Template available on the website)
- 7) In addition, applicants must ensure the submission of at least **two reference letters** (template available on the website) from scientists with whom the applicant has studied or worked. Letters should be sent directly by the referees to the specific e-mail address of the rePLANT programme (replant@cragenomica.es) and should also be received by the application deadline. Instructions about how to write a letter of reference will be available in the webpage of the rePLANT programme. The letters must be as informative as possible and should refer clearly and objectively to the professional, technical, and academic abilities of the candidate.

2.3 Eligibility criteria

Eligibility criteria and application requirements

- Researchers must be **doctoral candidates, i.e. not already in possession of a doctoral degree** at the deadline of the call. Researchers who have successfully defended their doctoral thesis but who have not yet formally been awarded the doctoral degree will NOT be considered eligible. Researchers must be enrolled in a doctoral programme leading to the award of a doctoral degree in the University of Cologne at the time of signing the contract.
- **Candidates must hold a degree that allows admission to the official doctoral programme** at the University of Cologne at the time to join the host institution (it is not requested the candidate to hold the degree when the candidate applies). For instance, to join the MPIPZ, candidates must hold a degree equivalent to a German Master, i.e. a degree with at least 4 years of studies in a related subject, which is not a Bachelor degree.
- Applicants **must not have resided in, or carried out their main activity (work, studies, etc.), in the country of the recruiting institution (Germany) for more than 12 months in the 3 years immediately before the call deadline**. Short stays, such as holidays, will not be taken into account.

Exceptions to the mobility rule will be considered only in duly justified exceptional cases and upon approval by the REA project officer, for example for researchers undergoing a procedure for obtaining refugee status under the Geneva Convention, parental leave or military services.

- **Researchers from any nationality may apply.** If selected, candidates will have to demonstrate an acceptable level of English language before they can be admitted onto the programme.

Gender dimension and other diversity and inclusive aspects

As previously mentioned, CRAG and MPIPZ are committed to excellence in recruiting according to the principles of equal opportunity. In addition, individuals with disabilities are encouraged to apply.

2.4 Documents of interest

The following documents will be available in the rePLANT website (<https://www.cofund-replant.eu/>):

- Guide for applicants
- Statement of research of interest
- CV Template
- Mobility Declaration
- Ethics self-assessment
- Guidelines: How to complete your ethics self-assessment
- Reference letter template
- Redress template
- Guide for evaluators

3. SELECTION PROCESS

3.1 Evaluation Process

The evaluation process is divided into five stages:

1) Administrative Eligibility check (1 week): once the call has closed, a team with representatives from CRAG and MPIPZ will check that applicants a) fulfil the eligibility rules; and b) have submitted all obligatory documentation and that it respects the formatting rules. Applicants will be informed about the results of the eligibility check, and those who failed in submitting documentation or the reference letters will have one week from the rePLANT notification to amend the missing documentation, except for the statement of research, summary of the key paper and CV that cannot be amended after the administrative eligibility check. Ineligible applications will not be evaluated.

2) Assessment Process (4 weeks). A gender-balanced Selection Committee, formed of external independent experts from recognized national and international universities, research centres, and industry will remotely evaluate the applications. The Selection Committee will include experts from the main thematic areas that reflect the scientific scope of rePLANT. The number of experts participating in the Selection Committee will depend on the number of applications. In all cases, each proposal will be evaluated by at least 3 experts.

Conflict of interest between applicants and experts will be avoided. If evaluations are significantly divergent in scores for a given application (e.g., > 33% difference between the experts), an additional evaluation by a fourth expert to resolve the discrepancy will be requested.

The Assessment Process will take into consideration the education and previous training of applicants, their motivation, the research project analysis and the potential of students by examination of the writing and logical thinking, as inferred from the review of the key publication.

All applicants will be informed about the results of the evaluation. The evaluation report will include the score and feedback to the applicant about the strengths and weaknesses of the application.

Following the ranking list, it is expected that at least the top 3 candidates for each research group will be invited to an interview.

3) Interviews (1 week): Selected applicants will be invited to present an example of a previous research experience, setting out their knowledge and skills to the Interview Committee. The Committee will include experts from the main thematic areas of the Assessment Process. Each interview panel will be formed by at least 1 international external expert, 2 senior researchers from the institution recruiting with no conflict of interest in the call, and a representative from a gender/equality committee of Crag.

All interviews will be conducted in English by videoconference.

Applicants will be asked to give a 10-minute presentation of themselves and their proposal, followed by 20 minutes of questions and answers, based on a catalogue of questions that will be made available to the Interview Committees to increase objectivity during the interviews. This evaluation stage puts more emphasis on the potential of the applicant. All applicants will be informed about the results of the interview. The final evaluation report will include the score and feedback to the applicant about the strengths and weaknesses of the application with regard to the evaluation criteria.

4) Final ranking of applicants: After the interviews are completed, the final score for each applicant will be calculated, taking into account the results of both the assessment process and the interview. The final ranking list will be produced, identifying the awardees and those to be considered as reserve list. The final ranking list will be publicly available at the website.

5) Ethical evaluation: the projects selected for funding will be reviewed by the Ethical Committee to ensure that the projects comply with the EU's ethical principles, Spanish, British, German and international legislation applicable in this field, as well as the Charter of Fundamental Rights of the European Union.

6) Appointment of selected applicants: the selected applicants will be invited to initiate the appointment process. Selected applicants will be required to confirm acceptance of the offered position within 10 days. If an offer is rejected or the applicant does not reply to the offer in the allotted time, the reserve list will be activated by order of ranking. In case of some vacancy is not covered after the evaluation process or the appointment process, candidates in the reserve list will be invited (in rank order) to join an available vacancy, if any, even if the vacancy corresponds to a different research group than the one the candidate applied to. The Selection Committee will evaluate the suitability for the candidate to join a different research group than the original one. Selected applicants will have up to 3 months to join the recruiting institution with deadline January 2024.

3.2 Evaluation criteria

The evaluation of rePLANT applications will be objective, independent, free of conflicts of interest and the selection will be based on merits, equal opportunities and freedom of choice of research. The following evaluation criteria that will apply to all candidates.

Administrative Eligibility check

CRITERIA 1: Eligibility rules (eligible/not eligible);

CRITERIA 2: Documents requested (eligible/not eligible).

Evaluation criteria for the Assessment Process

The assessment will be based on the documents submitted with the application. The Assessment Process will be focused on the education and previous research experience, the research project proposed and the writing and logical thinking of the candidate:

CRITERION 1: Education and training (40/100)

1.1 Education: education, level and grades achieved, suitability for the project proposed (Score: 0-20).

1.2 Research experience: research skills acquired, ability for scientific analysis, scientific production in terms of publications, patents, and attendance to international conferences, etc. (Score: 0-20).

CRITERION 2: Statement of Research (30/100)

2.1 Motivation for applying for rePLANT (Score 0-10)

2.2 Quality, originality, innovative nature of the project analysis, including international, interdisciplinary and intersectoral aspects (Score: 0-10).

2.3 Coherence and feasibility of the research plan (Score: 0-10).

CRITERION 3: Writing and logical thinking (20/100)

3.1 Ability to analyse, summarise and explain a research paper (Score: 0-20).

CRITERION 4: Support of referees (10/100)

4.1 Theoretical knowledge and technical proficiency of the candidate, overall performance, strengths, areas of improvement or skill development, ability to work independently and as part of a team should be addressed and will be evaluated. Assessment of the reference letters should take into account the suitability and aptness of the person who writes the letter with regard to the candidate's project (Score: 0-10)

The overall threshold for applicants to be ranked for interviews will be 70/100. In case of ex aequo, priority is given to the score for Criterion 1.

Evaluation criteria for the Interview

This phase puts more emphasis on the future potential of the applicant (rather than their past success) and will be based on the following criteria:

CRITERION 1: Scientific knowledge and research skills (Score: 0-50);

CRITERION 2: Presentation and communication skills, defence of the project and ability to take part in scientific discussions (Score: 0-20);

CRITERION 3: Motivation for applying for rePLANT fellowship (Score: 0-15); and,

CRITERION 4: International and/or multicultural experience (Score: 0-15).

The overall threshold for applicants to advance to the final ranking step will be 70/100. In case of ex aequo, priority is given to the score for Criterion 1.

Final Ranking

The final score will be calculated based on the score of the Assessment Process (weight 60%) and the score of the Interview (weight 40%). The threshold for selection will be 75/100.

PHASE	CRITERIA	SCORE	TOTAL SCORE	THRESHOLD	WEIGHT
1. Administrative eligibility check	CRITERION 1: Eligibility rules	n/a	n/a	Eligible / not eligible	n/a
	CRITERION 2: Documents requested				
2. Assessment Process	CRITERION 1: Education and training	0-40	0-100	70	60
	CRITERION 2: Statement of Research	0-30			
	CRITERION 3: Writing and logical thinking	0-20			
	CRITERION 4: Quality and support of referees	0-10			
3. Interview	CRITERION 1: Scientific knowledge and skills in the area of research	0-50	0-100	70	40
	CRITERION 2: Presentation and communication skills, defence of the project and ability to take part in scientific discussions	0-20			
	CRITERION 3: Motivation for applying for rePLANT	0-15			
	CRITERION 4: International and/or multicultural exp.	0-15			
FINAL SCORE = Total Score from phase 2 * 60% + Total Score phase 3 * 40%				75	

3.3 Redress

After receiving feedback on the evaluation of their proposal, the applicants can initiate a request for redress within 10 working days after each Provisional Resolution has been published. Requests must be sent by email to the address provided on the rePLANT website. The Redress Committee will decide and provide a definitive reply. Applicants will receive the decision on the redress request within 10 days after the Redress Committee has convened. Decisions of the Redress Committee are final. Redress procedures are concerned with the evaluation and/or eligibility checking process. The committee will not call into question the scientific or technical judgement of appropriately qualified experts.

A re-evaluation will only be carried out if there is evidence of a shortcoming that affects the final decision on whether to fund a submitted proposal or not.

4 ABOUT MPIPZ

The MPIPZ (<https://www.mpipz.mpg.de/en>) is one of 86 Max Planck Institutes and one of two MPis fully dedicated to plant science research. The research programme is defined by four scientific departments and, in line with the mission of the Max Planck Society, conducts basic research on fundamental plant traits to transform plant breeding into a rational, predictive science. The Scientific Departments at MPIPZ are:

- **Plant Developmental Biology.** The primary scientific goal of the Department of Plant Developmental Biology is to study molecular mechanisms that regulate the responsiveness of plant development to environmental cues.
- **Chromosome Biology.** The department of Chromosome Biology at MPIPZ uses cutting-edge technologies in microscopy, genetics and genomics to understand how genetic information is transmitted and modified over generations, with a particular focus on the mechanisms of meiosis.
- **Plant Microbe Interactions.** Research in the Department of Plant Microbe Interactions engages in fundamental molecular processes underlying interactions between plants and pathogenic or beneficial microorganisms.
- **Comparative Development and Genetics.** The department Comparative Development and Genetics seeks to address two fundamental questions in biology: how do biological forms develop and what is the basis for their diversity?

MPis have a highly collaborative character and departmental and independent research groups at the MPIPZ interact closely, demonstrated by the fact that two thirds of all research articles published in 2020 and 2021 were co-authored by more than one MPIPZ group.

The Institute is further embedded into the Cluster of Excellence on Plant Sciences (CEPLAS), Germany's only Excellence Cluster (<https://www.ceplas.eu/en/>) exclusively focussing on plant sciences. CEPLAS provides ample opportunities for local collaborations which fit well with the rePLANT programme since synthetic and reconstruction biology is one of four key research areas of CEPLAS.

Future Projects

Future discovery-oriented plant biology at the MPIPZ will utilise integrated approaches to elucidate networks of fundamental biological processes in plants. Multidisciplinary approaches bridging genetics, biochemistry, cell biology and bioinformatics will be essential for in depth understanding of the molecular mechanics of traits that are relevant to plant breeding. While genetic methods have proven invaluable for the dissection of complex plant traits, small molecules can significantly complement this toolbox.

Comprehensive analysis of thousands of plant samples is necessary to isolate one plant sample that exhibits a mutation, for instance in photosynthetic processes. For this reason, the institute will endeavour over the next few years to further automate mutant and DNA analysis. Additional modernizations at the institute will be necessary in the area of climatic chambers and greenhouses where plants can be grown under controlled conditions. Furthermore, the detailed collection and evaluation of molecular research results will require the upgrading of data banks and networks. Bioinformatics is useful in applying statistical procedures for DNA sequence analysis to draw up

extensive genetic maps. It also helps in the simulation of biological processes, with regard to breeding applications.

Institute work will allow a steady contribution to achieving goals set out for breeding that were previously difficult or impossible to attain. Research will also provide a scientific basis for sustainable agriculture.