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Recognising the importance and impact of Imaging Scientists: Global guidelines for establishing career paths within core facilities

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Abstract

In the dynamic landscape of scientific research, imaging core facilities are vital hubs propelling collaboration and innovation at the technology development and dissemination frontier. Here, we present a collaborative effort led by Global BioImaging (GBI), introducing international recommendations geared towards elevating the careers of Imaging Scientists in core facilities. Despite the

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critical role of Imaging Scientists in modern research ecosystems, challenges persist in recognising their value, aligning performance metrics and providing avenues for career progression and job security. The challenges encompass a mismatch between classic academic career paths and service-oriented roles, resulting in a lack of understanding regarding the value and impact of Imaging Scientists and core facilities and how to evaluate them properly. They further include challenges around sustainability, dedicated training opportunities and the recruitment and retention of talent. Structured across these interrelated sections, the recommendations within this publication aim to propose globally applicable solutions to navigate these challenges. These recommendations apply equally to colleagues working in other core facilities and research institutions through which access to technologies is facilitated and supported. This publication emphasises the pivotal role of Imaging Scientists in advancing research programs and presents a blueprint for fostering their career progression within institutions all around the world.

KEYWORDS
career path, collaboration, core facilities, Global BioImaging, global survey, Imaging Scientist, innovation, professional development

1 | INTRODUCTION

Imaging core facilities play a crucial role in modern research, promoting collaboration and acting as catalysts for the establishment and advancement of an efficient and sustainable research ecosystem. Over time, as cutting-edge technologies have become increasingly expensive and technically challenging to master, the importance and prominence of core facilities have grown. Fundamental to imaging facilities are ***Imaging Scientists*** (Box 1, Figure 1) who provide the expertise, advice and training to maximise impact and support researchers in pursuit of imaging-related excellence. Imaging Scientists are becoming increasingly involved in and instrumental in the success of cross-disciplinary research projects that require the application of multiple advanced technologies. Imaging Scientists in core facilities often participate in experimental design, sample preparation, technology adaptation, data acquisition and image analysis while ensuring and instilling a healthy respect for research integrity and technical quality assurance.[1]

Imaging Scientists are at the forefront of innovation in their respective fields, constantly pushing the boundaries of imaging technologies and their applications, contributing to scientific advancements, and addressing real-world challenges. Importantly, to be effective, Imaging Scientists in core facilities have also developed and often need to apply a range of skills beyond their scientific and technical domains, extending to leadership, managerial, pedagogical and administrative responsibilities. This can include effective time and people management, project management, communication skills, strategic planning, budgetary management, supervision of students, teaching and grant writing.

During the last two decades, forward-thinking scientists around the world, working in and with imaging core facilities, have pioneered new career paths (Figure 1)[2–4] (see also: https://www.imagingscientist.com/). However, significant challenges remain on the path to proper recognition of the value and impact of these Imaging Scientists and what they contribute to the research enterprise. There is often misalignment in performance indicators and limited opportunities for promotion, career advancement and job security.[5]

In order to address these challenges, the Global BioImaging (GBI) Working Group on *Career Path for Imaging Scientists (working in Core Facilities)* has developed these international recommendations for Imaging Scientists and their host institutions. The work aims to provide recommendations for navigating the persistent challenges, drawing on the community's collective experience to support the careers of Imaging Scientists around the world. An extended version of these recommendations, with more information and supporting material, can be accessed on Global BioImaging's website. The recommendations are inspired by a comprehensive and long-running

Box 1: What is an Imaging Scientist?

A term to describe a professional who specialises in the field of imaging science, which involves experimental design, acquisition, analysis and interpretation of image data for various applications, including scientific research, medical diagnosis, engineering, industrial quality control, and many others in which imaging technologies are essential. Here, we have defined and classified distinct subgroups within the broader definition of Imaging Scientists (Figure 1), where each subgroup is characterised by overlapping tasks and affiliations. By employing this categorisation, we aim to investigate and analyse the career paths of Imaging Scientists, with a strong focus on those working within an imaging core facility (Group 1). For the purpose of clarity for this work, we have considered the following out of scope: (a) users of the core facility and (b) dedicated administrators in imaging core facilities who do not have a technical or imaging remit.

survey conducted among Imaging Scientists worldwide (Figure 2).

This work sets out international recommendations across three interrelated topics: Section 2 articulates the key value proposition and impact of Imaging Scientists; Section 3 facilitates the recruitment and retention of Imaging Scientists; and Section 4 supports and encourages training and professional development of Imaging Scientists. A key overarching theme permeating throughout is re-thinking the divide between traditional academic and Imaging Scientist's positions.

2 | HIGHLIGHTING THE VALUE AND IMPACT OF THE IMAGING SCIENTIST IN A CORE FACILITY

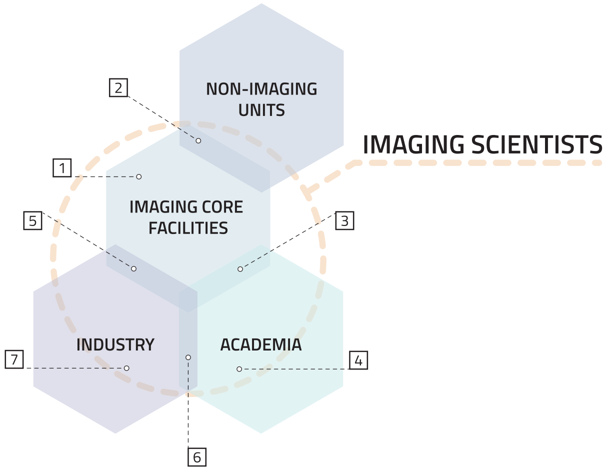
The value and impact of Imaging Scientists in core facilities is often overlooked. Measuring the impact is critical to justify the required improvements in career paths and open opportunities for career progression. There has been significant progress in recent years in measuring the impact and establishing appropriate Key Performance Indicators (KPIs) for academic researchers.[6] However, the parallel career paths for core facility Imaging Scientists have not yet had equivalent measures developed. Lejeune et al. provide a significant contribution to guide the measurement of the impact of core facilities as a whole and is useful to consider in this regard.[7] Measuring the impact of Imaging Scientists is challenging due to the diversity of their contributions to multiple and simultaneous research projects combined with varied other tasks (Figure 3). For academic researchers, papers published or grants funded are used as impact measures, but the important contribution Imaging Scientists have on these same outcomes is frequently neglected.[8] For example, they may be acknowledged, but this is much harder to quantify and automatically assess than authorship. Similarly, it is undeniable that the training, consultation and support provided by Imaging Scientists play a crucial role in researchers going on to deliver high-impact papers, being competitive for grants, and succeeding in their own right, but this is similarly hard to quantify and track.[9]

The impact of an Imaging Scientist goes well beyond supporting publications or grant applications and should be assessed as such. They play central roles in the smooth operations of larger-scale infrastructures, both within institutions as well as at the cross-institutional level. We outline some of the key impacts below, which, while difficult to quantify, are critical to take into account (Figure 3).

Imaging Scientists in core facilities are **guardians of high-quality science** through two key pathways. First, they are responsible for the quality management of the instruments, with regular testing, evaluation adjustment and liaison with engineers. Significant initiatives for quality assurance, such as QUAREP-LiMi,[10] are driven by Imaging Scientists working in core facilities. Second, Imaging Scientists have a wealth of experience and tacit knowledge, which they apply to ensure good scientific practice in rigorous experimental design and data analysis, instilling research ethics and helping to avoid unintentional bias.[11] This capability is built on their experience gained through supporting experimental work of multiple varied projects in the facility. Their expertise and commitment to quality play a vital role in ensuring that research outcomes are reliable, reproducible and of the highest calibre.

2.1 | Experimental design

They drive scientific innovation, encourage the adoption of new technologies, adapt instrumentation, optimise sample preparation protocols, refine image acquisition and develop analytical approaches for the research projects they are involved with or support. Imaging Scientists, in many cases, directly support research, co-create research projects, provide consultation to scientists on the latest technological and methodology developments, adapt and customise image acquisition and analysis protocols and



1	Dedicated Core Staff	Imaging Scientists formally affiliated with the core facility and dedicated to enabling access and providing support to imaging technologies (Facility operations, training, service, maintenance, and administration) EM/LM/HCS/Bioimaging/Image Analysis.
2	Core Staff with split remit	Shared Role (Including staff working also in another core facility other than imaging core (Image Analysts/-Flow/Histology/Genomics/Mass Spec/Biomedical (Preclinical)/Medical/In Vivo imaging/Animal Facility/Medical Imaging Research Support)) or staff working partially in non-core facility roles, i.e. as lab technicians, technology developers etc.
3	Not Core facility affiliated Imaging Scientists	Academic staff working on Imaging Technologies and applications, not officially affiliated with a core, but strongly contributing to core facility functions. They might also fulfil core facility equivalent roles in institutions without dedicated facilities, providing training and support for other users (Superusers/Postdocs/Late-stage PhDs). Additionally, some Principal Investigators (PIs) may have leading or advisory roles, such as serving on a steering committee, which involves contributions to future-proofing, strategy, and sustainability.
4	Principal Researchers and Investigators	PIs, Research Scientists and Imaging Scientists who are key users of an imaging core facility.
5	Industry-related	Industry funded positions or seconded staff working within core facilities.
6	Technology developers	In academia or industry, the people who are developing new imaging solutions.
7	Industry exclusive	Only working for private companies.

FIGURE 1 Defining Imaging Scientists, the varied roles they fulfil, and the positions in which they sit, which often overlap. Throughout this work, the discussion will focus on Imaging Scientists working within or very close to imaging core facilities (Groups 1, 2, 3 and 5).

support or advise on the selection of the most suitable approaches to address the specific research question at hand.

The **training and education** provided by Imaging Scientists have a far-reaching impact. Many Imaging Scientists act as mentors, where they train both researchers and the next generation of Imaging Scientists. This training takes on diverse forms, from teaching during courses and workshops to the more widespread delivery of bespoke one-on-one practical training for facility users, the majority of whom are early career researchers. Core facility professionals are, therefore, continuously educating the next generation of scientists with customised training in advanced technologies tailored specifically to their researcher's needs. These long-term interactions support the skills development of researchers, who then build their own careers on the knowledge gained. Through the provision of high-quality educational programmes and access to key enabling technologies, Imaging Scientists play a role in the recruitment of top-class students, postgraduates and research staff and hence bolster the national and international reputation of the institution.

2.2 | Methodological innovation

Imaging Scientists in core facilities go beyond just supporting the acquisition of image data, often assisting users in upstream sample preparation and downstream image analysis and image data management to extract quantitative information and make the data FAIR for potential reuse. They often offer introductory training on both open-source and commercial analysis software and provide and support imaging workstations while consulting on and guiding research projects through the whole experimental pipeline. Although difficult to measure, this level of support, when compared to researchers starting with little knowledge or experience and on their own, undoubtedly has a significant impact on the pace of scientific advancement and discovery.

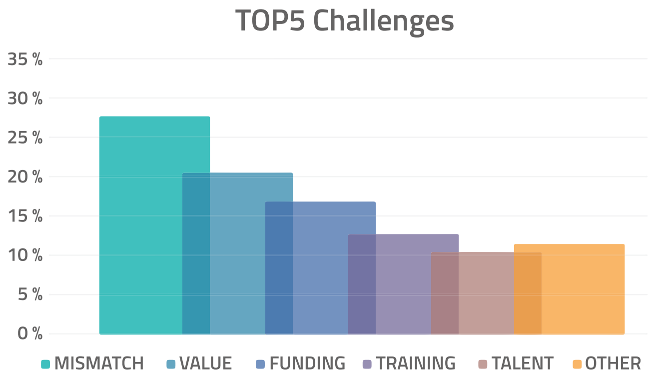


FIGURE 2 **Top 5 categories of challenges identified through a global survey**, which prioritised the focus of this work: (1) **MISMATCH** between the classic academic career path and more service-oriented roles; (2) lack of understanding of the **VALUE** and impact of Imaging Scientists and core facilities; (3) lack of financial/sustainable strategy or insufficient **FUNDING** security; (4) insufficient dedicated **TRAINING** and professional development opportunities; and (5) challenges with recruiting and retaining **TALENT** and expertise (242 submitted challenges, 66 individuals representing 25 countries). This data is reflective of the responses collected up to November 2023, prior to the publication of the GBI recommendations paper. The survey remains active, and we endeavour to track how this data evolves over time. Please follow the link to see current results and how to participate: Submit TOP5 Challenges.

2.3 | Technological innovation

Overall, Imaging Scientists drive research and innovation by continuously improving imaging technologies, developing novel techniques and collaborating with researchers from various disciplines to solve complex problems and answer important scientific questions. Some Imaging Scientists are also directly involved in technology development (e.g. Group 6 in Figure 1). This innovation can involve close interaction with industry or technology developer labs, for example, licensing out intellectual property or spinning out companies. Further, with deep insights into the needs of the research community, they can effectively guide technology development by instrument manufacturers. By serving as alpha/beta-testers, Imaging Scientists can gather crucial real-world feedback and make meaningful contributions to innovation and product development and refinement while enabling early access to emerging technologies for their local research community.

2.4 | Advancements in knowledge and knowledge transfer

Imaging Scientists are strong assets in realising the full potential of the technologies and disseminating their knowledge widely within their community. This contributes to the general increase of knowledge transfer of the latest research methods within the local research community and is a crucial aspect of training and education for students.

As Imaging Scientists in core facilities support many research projects from different domains and departments, they play a pivotal role **as project multipliers and interdisciplinary bridges** in their research environment, connecting researchers and adding value to projects that may otherwise remain remote from one

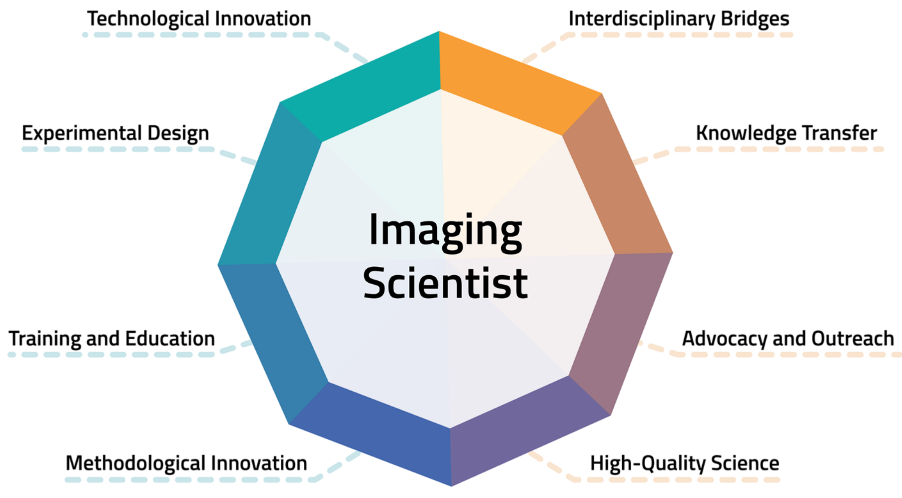


FIGURE 3 What is the role of Imaging Scientists? This figure highlights the diverse range of tasks undertaken by Imaging Scientists within core facilities. A key theme spanning many of these tasks is the ability to effectively communicate and productively liaise with scientists from a range of different disciplines, effectively adding value to a wide variety of research projects. Here we have attempted to classify the tasks carried out by Imaging Scientists into those directly associated with the role (the left of the diagram), and less-tangible roles that are less well known or recognised (the right of the diagram).

another (Figure 1). This is especially key in facilitating interdisciplinary cutting-edge science and can help to avoid uncoordinated duplicative efforts while being the central liaison for communication between different scientists.

2.5 | Advocacy and outreach

Thanks to its visual and aesthetic nature, imaging is a very popular vehicle for engagement with and outreach of scientific research to the general public, school students and institutional visitors. Imaging Scientists often passionately contribute to community work and outreach activities, but these are often poorly recognised or rewarded despite the clear benefits to science and society.

Core facility professionals may not pursue all these different facets of work at any one time, but the variety and flexibility of responsibilities and roles is often an aspect that makes the profession attractive (Figure 3). Imaging Scientists in core facilities often need to adapt to a wide range of research projects and disciplines. Their roles may vary from one project to another, making it challenging to define a fixed set of responsibilities. The nature of research projects can also be highly variable in terms of duration and complexity. Imaging Scientists may work on short-term, intensive projects or in long-term, ongoing research efforts. This diversity and variability of the position sets a key challenge for determining roles and assessing performance. Institutional hierarchies are typically more embedded on the research side and, therefore, primarily use more traditional academic metrics. In designing the roles and responsibilities for Imaging Scientists in core facilities, institutional leadership needs to be clear on what is expected of them (Supplementary Material A), how their contributions will be measured (below), and how this equates to the potential for career progression[12] (Supplementary Material B). We recommend a **2-tiered evaluation system,** which is weighted and applied according to the seniority of the role, comprising the following:

Academic metrics

- Contributions to publications and thesis
- Presentations at conferences/meetings
- Contributions to grant applications
- Contributions to student and staff training and academic supervision
- Grant reviewing
- Publication reviewing and journal editing
- Involvement in national and international strategy and review committees
- Organising conferences, meetings, networks, and community events.

Core facility-specific metrics

- Performance management within the facility
  - Financial measures e.g. cost recovery, funding breakdown
  - Equipment utilisation
  - Maximising the user base (when open access to resources is an expectation)
  - Core team training and development
  - Quality management (e.g. Standard Operating Procedures (SOPs), International Organisation for Standardisation (ISO) certification)
- User satisfaction surveys, endorsements, post-training feedback
- Contributions to student and research staff training (e.g. microscopy courses, 1:1 customised practical training sessions, image analysis training)
- Technology and application adaptation/development
- Industry partnerships
- Contributions to outreach initiatives (including facility visits and tours)
- Contributing to city, regional, national and/or international-level networking initiatives
- Involvement with learned societies and organisations
- Management and leadership

3 | RECRUITING AND RETAINING PERSONNEL

Imaging Scientists are key repositories of institutional knowledge. As research groups undergo natural turnover due to academic transitions, such as students completing their PhDs, Imaging Scientists play a vital role in maintaining research continuity, retaining technique expertise, bridging knowledge gaps and training new lab members. This section is divided into two parts: (1) recruitment for those with the authority to create and fill new Imaging Scientist positions and (2) retention to support existing Imaging Scientists in core facilities.

Core facility Imaging Scientists tend to occupy a role that blends technical, administrative, managerial, and research skills (Figure 4), but their job descriptions and scope of role and responsibilities often do not match the actual work carried out. Consequently, they often go unacknowledged and unrecognised for their contributions. The need for clarity and recognition that values the contributions of Imaging Scientists outside of the traditional academic career trajectory is essential to recruiting and

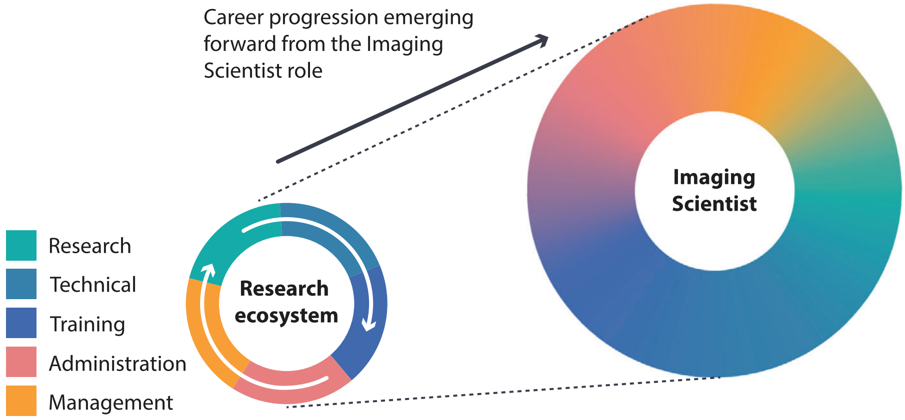


FIGURE 4 The multifaceted job components of the Imaging Scientist role highlight the diverse skills that may be required in a core facility career. The emergence of this combination of skills and responsibilities is relatively new to the broader global academic sector and tends not to fit with the traditional career progression models.

retaining talented and valuable people. In many institutions, Human Resources departments are unfamiliar with core facility careers as a separate path, which can result in attempting to fit these jobs into the traditional academic/administrative construct.

3.1 | Recruiting

To enhance the recruiting process for Imaging Scientists in core facilities, we recommend the following strategies:

3.1.1 | Broad outreach and job posting

We encourage the posting and advertising of positions through a variety of imaging community networks to ensure wide reach to the target audience and encourage diverse applications (including but not limited to MicroscopyDB, Global BioImaging's partner communities and their respective newsletters, Microlist, confocal listserv, image.sc forum, etc,). We have proposed a generic job description template (Supplementary Material A) to cover a broad range of potential positions within a core facility, which can be tuned for purpose. Supplementary Material B proposes a job family, including roles, responsibilities and expectations in a hierarchical/progression framework.

3.1.2 | Inclusive application process

We recommend requesting applicants to self-describe their experience with imaging, analysis and service roles. We strongly encourage a commitment to equality, diversity and inclusion (EDI) in the recruitment process with access to funds to assist with relocation or visa applications.

3.1.3 | Structured interview steps

We recommend several rounds of interviews for candidates with diverse representation on the interview panel (e.g. Imaging Scientists, facility users, research faculty) and a consistent evaluation criteria and template in pursuit of fairness.

3.1.4 | Stable funding commitment

Funding for core positions should be carefully considered. The institutions must guarantee investment (i.e. stable institutional funds) to provide assurance and stability to highly trained and experienced staff and provide resilience in the event of downtime or fluctuations in utilisation, in alignment with the overall business model of the individual core facility.

3.1.5 | Longer-term employment

We recommend Imaging Scientists in core facilities are hired with a 3- to 5-year term and, ideally, longer or permanent positions, with options for renewal and promotion. Several articles have noted the need for creating permanent staff positions in the biomedical sciences and cite core facilities as examples of how this advances the research ecosystem.[13,14]

3.2 | Retaining

To facilitate the retention of Imaging Scientists, we propose the following measures:

3.2.1 | Development of job families and title framework

Institutions and hiring managers should establish job families and a structured title progression framework for core facility staff roles (see Supplementary Material B). This framework should incorporate mechanisms for recognising and rewarding employees through promotions and salary increases while providing transparency regarding their position within the framework, potential career progression and clear expectations for different levels.

3.2.2 | Involving imaging Scientists in the strategic decision-making process

These professionals possess invaluable expertise in advanced imaging technologies and their applications, making them essential contributors to the innovation and efficiency of imaging facilities. By involving Imaging Scientists, institutions can align their imaging capabilities with broader institutional goals, optimise resource allocation, foster collaboration and promote transparency.

3.2.3 | Recognition of impact, experience and continuous professional development (CPD)

Mechanisms should be in place to acknowledge the contributions, expertise and ongoing professional development of Imaging Scientists (Section 4), in addition to relevant performance metrics (Section 2: 2-tiered evaluation system). This recognition should extend beyond formal qualifications to encompass relevant experience and expertise. This approach enhances the flexibility to attract, hire and retain top talent, whether or not they hold advanced degrees. Evaluating the impact of Imaging Scientists should consider a holistic assessment of their contributions to enable research and innovation through knowledge, technology, clinical applications, education, collaboration, ethics and society.

3.2.4 | Knowledge sharing and collaboration

Institutions should seize the opportunity to share best practices, resources, and lessons learned with other organisations to enhance visibility, clarity and consistency in roles, responsibilities, recognition, and career pathways for Imaging Scientists.

3.2.5 | Partnership models

Collaboration between research groups and Imaging Scientists in core facilities should adopt partnership models. Initiating project kickoff meetings is encouraged to discuss and document consensus on experimental design, responsibilities, roles, and, importantly, recognition in research publications and outcomes. These discussions should occur at the project's outset to ensure alignment of expectations among all participants[15] (Section 4).

3.2.6 | Task prioritisation and transparency

Managers are encouraged to define the desired allocation of time and effort for staff members responsible for the effective operation of an imaging core facility. This empowers incoming personnel to better judge their time and effort and the relative importance of tasks.

3.2.7 | Enhancing mentoring and career development

Within core facilities, managers play a pivotal role in supporting research initiatives through comprehensive mentoring and career development dialogues with Imaging Scientists. These dialogues should encompass a spectrum of growth opportunities, including the potential for equipment oversight, team management, and the assumption of supplementary administrative responsibilities such as budget management, coordination of major funding requests, asset lifecycle supervision and space allocation.

4 | TRAINING AND PROFESSIONAL DEVELOPMENT OF IMAGING SCIENTISTS

Training and professional development opportunities are required to ensure that the career paths for Imaging Scientists in core facilities are both nurtured and supported. In this section, we provide recommendations, which we encourage core directors and institutional leaders to embrace to ensure that Imaging Scientists thrive and can continue to grow and effectively support their institution's research programs.

There are a host of professional development activities available to Imaging Scientists, including advanced technical training, leadership and management training, participation in imaging-related scientific societies and their meetings, grant writing, authorship of scientific papers, teaching and outreach activities. In addition, mentorship programs provided by professional societies are available to provide one-on-one sharing of experiences, best practices, and career advice (e.g. RMS Mentoring Track, ABRF Mentoring Program, CTLS Mentors).

Imaging Scientists should be **encouraged and supported to attend advanced technical training,** including (i) participation in in-person imaging courses and workshops, (ii) making use of the self-guided online training content and (iii) quality management courses, such as ISO certification programs, where relevant. Participation in specific scientific discipline meetings is also a valuable experience.

Imaging Scientists should be **encouraged and supported to attend regional, national and international meetings of imaging and other core-related scientists**. These present excellent opportunities to share information and experiences with colleagues, build and sustain professional networks and keep up-to-date on the latest technological developments.

Imaging Scientists should be **encouraged and supported to participate in grant writing and publishing of research results**. These activities leverage the technical expertise of the Imaging Scientist to ensure experimental results meet rigour and reproducibility standards and reward Imaging Scientists for their invaluable contributions. Importantly, Imaging Scientists share responsibility for ensuring that image data meets the FAIR Principles. There remain several challenges in the identification of core facility involvement in scientific publications.[9] We remind institutions that the fee-for-service model is an insufficient reason for denying co-authorship of manuscripts since it is likely that all the other co-authors have been paid for their work. When in doubt, we highly recommend that institutions consult the International Committee of Medical Journal Editors (ICMJE), which describes who the author is and what merits authorship in publications. Furthermore, the RMS has drafted guidelines and policies for acknowledgements of core facilities and provides a poster to highlight the importance of this recognition to a facility's user base. In terms of enhancing research integrity and traceability in scientific outputs and outcomes, the use of Persistent Identifiers (PIDs) such as Digital Object Identifiers (DOIs), Research Resource Identifiers (RRIDs for instruments and Research Organization Registry (RoR) can help. Integrating PIDs for key facility contributions fosters transparency, acknowledges an individual's intellectual efforts, gives greater visibility to a core facility and indicates their liabilities.

Imaging Scientists should be **encouraged and supported to lead internal training initiatives** to enable the team to be cross-trained on various instruments and to allow for redundancy and back-up of critical tasks.

Imaging Scientists should be **encouraged and supported to participate in teaching activities**. These activities might include training users in basic and advanced imaging technologies and techniques, potentially contributing to more formal curricular courses and, importantly, learning pedagogical techniques for how to train more effectively.[16]

Imaging Scientists should be **encouraged and supported to lead professional outreach activities**. These activities might include events and programs for school-age students and community partners. Leading lab tours of visitors is another effective way to showcase Imaging Scientists' talents and the capabilities of core facilities, while providing an invaluable opportunity to hone skills and experience in presenting to diverse audiences.

Imaging Scientists should be **encouraged and supported to develop broader leadership and management skills**. This is especially important for Imaging Scientists employed in fee-for-service facilities where business administration skills are particularly valuable. There are a variety of ways to address this need, including executive education courses and network-sponsored workshops. Leadership development can also be facilitated through participation in leadership roles (Working Groups, Management Boards) in organisations and societies supporting core facilities and laboratories (e.g. CTLS, ABRF). Training courses for operators and managers of research infrastructures have also more recently become available (e.g., ARISE, RITrainPlus, GBI).

Institutions are **encouraged to adopt management structures that promote local, independent decision-making by Imaging Scientists**. This would allow Imaging Scientists to make regular operational decisions without having to seek permission from their immediate supervisor. By empowering the Imaging Scientist in this manner, institutions would increase decision-making dynamics and foster a more agile operational environment.

Institutions are **encouraged to support the growth and development of Imaging Scientists** working in core facilities to prepare them for senior roles such as Core Director. These roles are available to individuals who have accumulated many years of experience, having grown a skillset of significant depth and breadth.

The full version of the Global BioImaging International Recommendation paper documents several success stories collected from our global community in their quest to advance the career paths of Imaging Scientists in core facilities. Here we summarise the key overarching themes and strategies from these inspiring accounts, establishing a direct link between the real-world experiences of Imaging Scientists and the distilled principles that guide their success. First, a **high-level strategy** involves direct engagement with government and funding bodies to instigate national policy changes. Examples, such as the analysis of the imaging technology landscape in a given country, highlight the positive impact of targeting federal programs and funding opportunities.[17] Consequently, they showcase the importance of long-term funding to create career paths for research infrastructure specialists and the need for consistent high-level advocacy and policy-making to secure such funding.[18]

Second, **influencing local structures** within universities or institutes proves essential. Collaborative efforts among administrative and academic leadership successfully negotiate tailored progression pathways for core facility professionals.[19] Distinct approaches underscore the importance of adapting local structures to accommodate the unique roles and responsibilities of imaging professionals, fostering an environment conducive to sustained career growth.

Third, the imperative role of **training and continuous professional development (CPD)** is evident, with impactful initiatives and training programs highlighted. These endeavours emphasise the importance of coordinated training portfolios for the imaging community, promoting skill-sharing and professional advancement.[20] The power of **philanthropic and public funders**, fostering technology access and education for Imaging Scientist CPD in underrepresented communities, further contributes to the global enhancement of Imaging Scientists' career paths.

Lastly, the transformative **influence of networks and communities** within the imaging ecosystem is recognised, showcasing how collaborative efforts have the power to reshape career pathways for technical staff and contribute to the evolving landscape of research.

In conclusion, these strategies collectively emphasise the need for a multifaceted approach involving local, national, regional and international efforts to enhance the career paths of Imaging Scientists in core facilities globally. The detailed success stories and strategies provide valuable insights and inspiration for advocates and stakeholders seeking to promote positive changes within their respective contexts. The community is encouraged to share experiences, successes and diverse approaches to improving the career paths of Imaging Scientists (for more details, see: https://globalbioimaging.org/working-groups/career-path).

5 | CONCLUSION

This work illuminates the intricate landscape within which Imaging Scientists operate, navigating roles that are simultaneously research-oriented, service-driven and richly multifaceted. As we continue to champion the critical role of Imaging Scientists, who enable and accelerate research outcomes, we acknowledge the progress made and anticipate the promising developments on the horizon. This work serves as both a testament to our collective commitment and a call to action, urging stakeholders to invest in the growth and recognition of these frontier science positions.

The guidance and recommendations presented serve a threefold purpose. First, they are intended to encourage researchers, as well as institutions, to recognise the important role of Imaging Scientists in their research programs. Second, they are designed to assist managers and directors of imaging core facilities in effectively assessing performance and fostering ongoing career development within their teams. Third, they offer a blueprint for institutions to establish robust structures and frameworks that actively support the career progression of their Imaging Scientists.

Our recommendations aim to serve as a compass for bolstering the advancement and recognition of this vital role and supporting the development of career paths for individuals and within institutions. The diverse authorship illustrates the international collaborative effort behind these recommendations and recognises the imperative for exchanging ideas and experiences beyond one's home institution and regional context. Mentoring, guidance and support from peers in this field can offer a holistic approach while simultaneously building a community, uniting and amplifying impact.

We acknowledge the challenges in developing this work and want to remind the reader that this international recommendation represents an ongoing effort. We anticipate its continual development, driven by the evolving needs of our field and community. This is the condensed version of the initial iteration of an international recommendation, and we hope it serves as a catalyst for future efforts to refine, expand upon, and contribute to its ongoing development.

AUTHOR CONTRIBUTIONS

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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[1] https://www.nibb.ac.jp/abis/.
[2] https://www.africanbioimaging.org/.
[3] https://www.argentina.gob.ar/ciencia/sistemasnacionales/microscopia.
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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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