# University of the Witwatersrand, Johannesburg

## Postdoctoral Research Fellowship (2025)

We are seeking a recent PhD graduate to fill a postdoctoral research fellowship. This fellowship is related to an exciting research project that investigates the development and testing of small-scale vertical-axis wind turbines for backup domestic electricity generation. The duration of the fellowship is three years, with annual renewal based on performance and progress.

**Project Description:**

The project is funded by a Royal Society International Collaboration Award in collaboration with researchers at the Queen Mary University London (QMUL) and the University of Witwatersrand (Wits) in South Africa. This postdoctoral research fellowship is to participate in the collaboration by conducting research at Wits as part of the South African Team. The proposed project aims to tackle the unreliable generation and distribution of electricity in South Africa, which causes frequent power outages. These power outages disproportionately affect economically deprived, rural communities, which tend not to have the infrastructure or purchasing power to adopt off-grid approaches reliant on solar power. Wind power acts as a promising alternative resource to function as a back-up emergency energy source in domestic settings, with vertical-axis wind turbines generally considered to be the cheapest and most efficient devices per footprint area. However, such devices are only available in configurations which would be too large to fit in most domestic settings and are beyond the purchasing power of many households. Therefore, the current proposal seeks to develop a vertical-axis turbine which is much smaller in scale and thus cheaper, but still provides sufficient power output. However, the aerodynamic and mechanical properties of such small-scale turbines remain unknown. Particularly, the mechanical properties are important to ensure that the blades do not break and get projected from the device in close proximity to people in domestic settings. In order to achieve this aim, as part of the South African Team at Wits the postdoctoral research fellow undertakes to (1) test the aerodynamic design of a turbine at small scale using a series of wind tunnel experiments, (2) quantify the structural forces and fatigue life of the turbine blades during operation using a series of wind tunnel experiments, and (3) will undertake field testing of a prototype, small-scale wind turbine in representative real-life settings to characterize and optimise its aerodynamic and mechanical performance in rural South Africa.

**Keywords:**

Postdoctoral Research Associate in Experimental Aerodynamics; Johannesburg (South Africa).

**Minimum requirements:**

1. PhD degree obtained within the last 5 years
2. Disciplinary requirements

| **Qualifications** | **Essential** | **Desirable** |
|---|---|---|
| PhD (or close to completion) in a relevant scientific/engineering area from an Engineering, Mathematics or Physics Department | ☒ | ☐ |
| A good first degree or Masters' degree in a relevant scientific/engineering area | ☒ | ☐ |
| **Experience/Knowledge** | | |
| In-depth knowledge of fluid mechanics and hands-on experience in experimental aerodynamics research | ☒ | ☐ |
| Relevant research experience on unsteady aerodynamics applicable to wind turbines | ☐ | ☒ |
| Experience of developing wind tunnel set ups (or equivalent) and of using diagnostic techniques, such as particle image velocimetry | ☒ | ☐ |

| | | |
|---|---|---|
| Experience in planning and delivery of own workload, to agreed timescales and quality standards | ☒ | ☐ |
| Experience of effective working in a collaborative research team | ☒ | ☐ |
| Experience in maintaining accurate and up to date records | ☒ | ☐ |
| Good publication track record, as appropriate to career stage | ☒ | ☐ |
| Experience of communicating research outputs to third parties, such as conference participation | ☒ | ☐ |
| Experience of supporting PhD students and providing supervision/instruction to classes | ☐ | ☒ |
| **Skills/Abilities** | | |
| Wind tunnel diagnostics and data analysis tools, such as Python and/or MATLAB | ☒ | ☐ |
| Effective report-writing, written and verbal communication skills. Able to adapt style/approach appropriately to suit the audience. Effective team working with a collaborative style. | ☒ | ☐ |
| Develop and/or implementation remote unattended data acquisition system for field testing in rural South Africa. | ☒ | ☐ |
| Proven ability to maintain accurate and up to date records | ☒ | ☐ |
| Ability to organise and prioritise own work and organise research within the project timetable | ☒ | ☐ |
| Experience of using Microsoft Office packages (Word, Excel, Outlook and Powerpoint) | ☒ | ☐ |
| Able to apply appropriate judgement in a range of non-routine work situations and prioritise appropriately under pressure | ☒ | ☐ |
| Advanced IT, numeracy and analytical skills with a high level of accuracy and attention to detail | ☒ | ☐ |
| **Other** | | |
| Willingness to work flexibly to achieve the demands of the research programme. | ☒ | ☐ |
| Willingness travel to potentially remote and rural settings within South Africa for field research. | ☒ | ☐ |
| Self-motivated and able to work without close supervision | ☒ | ☐ |
| Organised and methodical, and able to use own initiative where appropriate | ☒ | ☐ |
| Ability to maintain confidentiality when handling sensitive data | ☒ | ☐ |
| *The ability to meet RSA Visa requirements. | ☒ | ☐ |

## Duties and Expectations:

As directed by/in consultation with the project supervisor:

1. Undertake focused and high quality research;
2. Undertake other activities related to the academic programme and the professional development of the individual;
3. Demonstrate/evidence of the following experience/ability:

- Contribute to writing bids for research grants
- Investigate models and approaches to test and develop them
- Regularly publish research work in refereed journals, disseminate findings at conferences, or exhibit work at other appropriate events
- Supervise the work of research assistants

**Contact:**

Send your CV directly to the potential host, Dr. Michael Atkins

Email: michael.atkins@wits.ac.za

Wits supports equal opportunities.