RESEARCH UNITS, CENTRES AND INSTITUTES

Annual Report Template

Please refer to the University of Auckland Policy on Research Units, Centres and Institutes for more information on reporting and accountability requirements (clause 2.5). A copy of this policy is available from the University Policy Register.

Section 1a - IDENTIFICATION INFORMATION:

<table>
<thead>
<tr>
<th>Title of Unit, Centre or Institute:</th>
<th>New Zealand National Eye Centre (NZ-NEC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of Director:</td>
<td>Professor Charles McGhee, HoD Department of Ophthalmology</td>
</tr>
<tr>
<td>Name of Deputy Director:</td>
<td>Professor Paul Donaldson, Professor Steven Dakin</td>
</tr>
</tbody>
</table>

Section 1b – ENDORSEMENT OF REPORT:

<table>
<thead>
<tr>
<th>Signatures:</th>
<th>Please sign in appropriate space below</th>
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<tbody>
<tr>
<td><strong>Professor Charles McGhee - Director</strong>&lt;br&gt; (Required for all Units/Centres/Institutes)</td>
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<tr>
<td><strong>Head of Department</strong>&lt;br&gt; (Required only for Department/School Units)</td>
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<tr>
<td><strong>Dean</strong>&lt;br&gt; (Required for Faculty/University Centres/Institutes)</td>
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Section 2 – ADVISORY BOARDS AND MEETING DATES:
## Names of Oversight Advisory Board members (for Faculty and University Centres that have Oversight Boards)

- Professor Charles McGhee
- Professor Paul Donaldson
- Professor Steven Dakin
- Sue Raynel – Manager NZ-NEC
- Hutokshi Chinoy – Administrative Manager

## Names of Expert Advisory Board members (for Faculty and University Centres that have Expert Advisory Boards)

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## Names of Management Committee Members (for University and Faculty Centres)

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## Dates of advisory board and management committee meetings that took place during the year

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## Section 3 – PARTICIPATING MEMBERS AND EMPLOYEES/STUDENTS:

### Names and Departments of participating members

Department of Ophthalmology, Faculty of Medical and Health Sciences; School of Optometry and Vision Science; Molecular Vision Laboratory.

Affiliated members: New Zealand National Eye Bank; Glaucoma New Zealand; Clinical and Experimental Ophthalmology; Department of Anatomy with Radiology; University of Auckland Bio-engineering Institute

### List names, positions, and FTEs of all staff employed and postgraduate students involved in the Unit or Centre

No staff are employed directly by NZ-NEC but provide assistance at discretion of the Departmental HoD’s.

See appendix for list of staff within NZ-NEC
Section 4 – INTRODUCTION:

| Provide here a brief introduction to the report (maximum of 300 words) | The NZ-NEC submitted a three year centre report and received positive feedback from the Faculty Review Committee. Their recommendations have been commented upon further in this report. In 2016 we had a successful in attaining research funding from competitive grants, philanthropy and industry in excess of $3.7 million dollars. Grants came from a wide variety of sources including: Marsden Fund $1,1500,000; ADHB $675,000; HRC $448,963.00; Catwalk Trust $362,548; Cure Kids $100,000; Industry projects via UniServices $390,000; philanthropic donations of over $260,000. Members of NZ-NEC have continued to develop national and international research collaborations in 2016. National collaborations include a large animal study underway at Lincoln University, Christchurch and international collaborations include projects with The University of Tasmania, Australia ($AUD 912,880); the State University of New York, at Stony Brook, USA ($US432,000); and the University of Lincoln, England (£UK202,820). These projects are funded for 2-5 years. The amounts of the international grants are not included in the NZ-NEC research fund total for 2016 as they are held in other organisations. There have been 10 book chapters and 105 peer reviewed publications from members in 2016. The glaucoma project continues and to date 8 optometrists have been credentialed by ADHB glaucoma specialists. Health Alliance on behalf of ADHB are in the process of contracting out to community optometrists the care of specific groups of glaucoma patients. |

Section 5 – AIMS, GOALS AND FUTURE PLANS:

| a. General Aims: Briefly describe the general aims (plans and objectives/goals) of the unit or centre. Identify how they address the University and Faculty Strategic Plan. | Vision: to eliminate preventable blindness and reduce visual impairment

Mission: to become a foremost international vision research, clinical and teaching centre through excellence, innovation and collaboration

Goals: To develop and increase the profile of eye health, vision research and education – in New Zealand/Aotearoa and internationally by:
Laboratory research
Clinical research and Clinical Services |
<table>
<thead>
<tr>
<th>Application of research into practice</th>
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<tr>
<td></td>
<td>Innovation</td>
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<td>Collaboration</td>
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<td>Teaching and Learning</td>
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<td>Community Outreach</td>
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<td>Public Health Policy</td>
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<tr>
<td><strong>b. Goals for Reporting Year:</strong></td>
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<tr>
<td>Describe the specific goals for the reporting year.</td>
<td>Submit an 'Eye Health' programme grant to HRC</td>
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<td></td>
<td>Expand on community programmes</td>
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<td></td>
<td>Research undertaken continues to produce innovations with scientific and clinical application</td>
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<tr>
<td><strong>c. Plans for Upcoming Year:</strong></td>
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<tr>
<td>Outline the plans for the next year. Identify any resource implications.</td>
<td>Continue with expanding community programmes</td>
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<td></td>
<td>Increase our research collaborations within UoA, nationally and internationally</td>
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<td></td>
<td>Submit HRC programme grant</td>
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**Section 6 – MAJOR ACHIEVEMENTS AND OTHER NOTABLE ACTIVITIES:**

<table>
<thead>
<tr>
<th>Report against the specific goals listed in 5b above</th>
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<tbody>
<tr>
<td><strong>HRC programme grant:</strong></td>
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<td><strong>Community Programmes:</strong></td>
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<tr>
<td>There have been several successful community based initiatives this year.</td>
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<td>1. Glaucoma project – 8 optometrists (4 from the community and 4 from SOVS) have been credentialed to review glaucoma patients in collaboration with the Ophthalmology Department, Auckland District Health Board. The patients will remain under the umbrella of eye services at ADHB with the community optometrists contracted to see a number of patients annually in their own practices to decrease the burden on the eye clinic. We are waiting for the contracts with community optometrists to be formalised by Health Alliance. There are another 4 optometrists who have just commenced up-skilling</td>
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<td>2. School of Optometry and Vision Science had two visits from the Whakapiki Ake MASH (Māori Achieving Success in Health) programme. This is the first year that SOVS has taken part in Whakapiki Ake, which is a recruitment programme that actively engages with rangatahi Māori enrolled in secondary schools to promote eye health as a career. The theme of the MASH visit was about diabetes and</td>
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</table>
its impact on health. The primary focus was on: simulating the effects of diabetes-related vision degradation on everyday life tasks and imaging the eye using a biomicroscope in order to spot the diabetes related pathologies.

“During each visit, we hosted 30 Māori students who were extremely positive about the experience. We conducted a survey at the end of each session to evaluate the success of these visits. We were extremely encouraged by the outcome of our latest survey,” says Dr Ehsan Vaghefi.

It is envisaged that this programme will elicit more applications from Māori into optometry. To further facilitate this, 2017 will see the introduction of two new He Rau Aroha Māori Scholarships for Bachelor of Optometry applicants.

3. SOVS Part IV students recently participated in the Family Violence workshop. The SOVS plans to implement this workshop into their undergraduate programme to ensure graduates are able to support victims of family violence in their practicing career.

4. Dr Mohammed Ziaie, Senior Cornea Fellow, Department of Ophthalmology was interviewed by the Listener magazine about contact lens wear and the risk of losing their sight by not being scrupulous about hygiene.

5. Dr Shuan Dai, Senior Honorary Clinical Lecturer and Paediatric Ophthalmologist, was interviewed by the Herald about the $121,000 Optical Coherence Tomography (OCT) eye scanner which has been purchased by Starship Foundation and paid for by Power Company, Mercury. This piece of equipment will provide an accurate diagnosis for children with visual impairment. This is a first of its kind equipment in Australasia.

Research undertaken continues to produce innovations with scientific and clinical application

Professor Steven Dakin was a member of an international team who have developed a new eye chart test for early detection of an age-related eye disease as it is designed to be more sensitive to the early signs of AMD. Researchers at the School of Optometry and Vision Science at the University of Auckland, the University of Ulster, and Moorfields Eye Hospital in London, have collaborated to develop the new eye chart test.
| Summary of major developments and achievements. Identify how these activities contribute to the research capability of the department or faculty (beyond what would be achieved through the activities of the individual members). Please provide greater detail for anything noteworthy that may give useful publicity to the University | NZ-NEC is one of the partners, along with the Royal Australia and New Zealand College of Ophthalmologists (RANZCO) and the University of Auckland, in the successful bid to co-host the 35th Asia Pacific Academy of Ophthalmology (APAO) Congress in 2020 in Auckland. This will be the first major conference to be held in the new Sky City Events Centre and the largest conference to be held in New Zealand with up to 5,000 delegates.

Dr James McKelvie (PhD), Senior Corneal fellow in Ophthalmology won the second prize in the Velocity $100K Challenge in the New Ventures category for his “CAT-TRAX”, a web based application which will dramatically reduce waiting times for cataract surgery, increase efficiency and cut costs.

A new paper by Ehsan Vaghefi, Paul Donaldson and Duncan Wu, looking at computational modelling of lens fluid dynamics has made the cover of IEEE Reviews in Biomedical Engineering.

Dr Jie Zhang, Postdoctoral fellow in Ophthalmology has been awarded a Marsden Fast-Start grant to investigate the proliferative and regenerative potential of adult stem cells recently found in the Transition Zone of the eye.

Professor Trevor Sherwin has been selected to do the prestigious Ida Mann lecture at the 48th Annual RANZCO Congress in Perth Australia in Nov 2017.

Tina Gao, School of Optometry and Vision Science was awarded a U21 graduate mobility scholarship to advance her collaboration with the internationally renowned visual neuroscience group within the School of Psychology at the University of Nottingham, UK.

Dr Hannah Kersten recruited to a joint appointment between the Department of Ophthalmology and the School of Optometry and Vision Science.

A new eye chart for early detection of AMD has been developed by Professor Steven Dakin (School of Optometry and Vision Science), working with researchers from the University of Ulster and Moorfields Eye Hospital in London.

Dr Ilva Rupenthal received an HRC Research Excellence Award in May 2016 for her outstanding contribution to health research excellence as an emerging researcher at the University of Auckland. |
HRC emerging researcher first grants were received by Dr Jie Zhang ($149,609) and Dr Stuti Misra ($149,354) over the next 2 years.

Jason Turuwihenua, School of Bioengineering and SOVS, is leading an international group of researchers to develop tests suitable for use with children as young as 2-years old. In 2016, the group received funding of $1 million over two years from the Ministry of Business, Innovation and Employment (MBIE), to allow them to develop practical eye tests to be deployed in clinics.

Dr Shuan Dai is the recipient of the Distinguished Clinical Teacher Award 2016 from the Faculty of Medical and Health Sciences at the University of Auckland.

Associate Professor Jennifer Craig’s presentation on ‘intranasal neurostimulation for dry eye’ was identified as a ‘Hot Topic’ at the American Academy of Optometry.

A/P Trevor Sherwin was promoted to Professor, Dr Andrea Vincent promoted to A/Professor in Department of Ophthalmology and Bhav Solanki and Wanda Lam in SOVS were both promoted to the highest grade of professional teaching fellow (PTF 4) in 2016.

Students within NZ-NEC have had another successful year:

- Yeri Kim, PhD student, won first place at the SOM Doctoral Showcase held on 6th December.
- Priyanka Agarwal, PhD student, BOTU won the best poster prize in the cornea/ocular surface section at the European Vision and Eye Research Conference in France.
- HealthX 2016: Hans Vellara, PhD student was runner up AMRF Doctoral oral presentation award, Himanshu Wadhwa BMedSc.Hons student – Second runner up non-Doctoral oral presentation award.
- Himanshu Wadhwa, BMedSc.Hons student, with collaborators Salim Ismail and Jane McGhee, won the BIRU confocal and overall prize for his sphere cell image

<table>
<thead>
<tr>
<th>Comment on any co-operative commercial activities, research with other University or Government laboratories or research</th>
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<tbody>
<tr>
<td>1. Dr Carol Greene, Professor Trevor Sherwin and Professor Colin Green have had their work on cell reprogramming furthered with funding from the Faculty Research and Development Fund, an HRC Explorer Grant and a Return on Science Fund grant. A large animal study is underway at Lincoln University,</td>
</tr>
</tbody>
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groups

Christchurch for final proof of concept of this patent protected technology aimed at the treatment of keratoconus in the first instance, and potentially myopia.

2. CoDa Therapeutics / Ocunexus: In 2015 there was renewed interest in ocular indications and a better understanding of our mode of action developed. In January 2017 the company restructured with an ocular focus, a new name (OcuNexus Therapeutics Inc.). Professor Colin Green continues to provide advice and has been appointed as Chief Scientist for the new company.

3. BOTU continued the project with Novaliq, Germany, using the developed ex vivo model to evaluate the penetration of various formulations into the ocular tissues after topical application. This model allows screening of ocular formulations at an early stage of development and could reduce the cost and complexity of testing routines currently used by the pharmaceutical industry. Presenting her data on Cyclosporine A penetration at the European Association of Vision and Eye Research meeting in Nice in September 2016 won Priyanka Agarwal the prize for best poster in the corneal/ocular surface category. Results from this research were also presented at ISER in Tokyo, Japan, and Asia-ARVO in Brisbane, Australia.

4. Professor Paul Donaldson (Physiology) and Dr Ehsan Vaghefi (Optometry) have in collaboration with Professor Thomas White from the State University of New York, at Stony Brook been awarded funding ($US432,000) from the National Eye Institute (NEI) in the United States for a period of 5 years to examine the effects of aging the lens transport systems that determine ion and water homeostasis, water content, and therefore the optical properties of the normal and cataract lens.

5. Corneal Accommodation – Complete Proof of Concept with Hons student in 2017 to get this into a viable device for translation. Collaboration between Professor Colin Green, Charles McGhee and Dr Stuti Misra.

6. Professor Colin Green is a collaborator on a Diabetes UK grant with the University of Lincoln, England. This grant (£UK202,820) is to look at connexin hemi-
channel roles in kidney fibrosis in diabetes.

7. A/Professor Andrea Vincent is an associate investigator on a $AUD 912,880 grant investigating Gene Identification for Keratoconus from the National Health and Medical Research Council, Australia.

8. Professor Steven Dakin in collaboration with researchers from the University of Ulster, and Moorfields Eye Hospital in London, has developed a new eye chart test for the early detection of AMD.

Patents:


Comment on any courses given or workshops and seminars held

Monthly NZ-NEC seminars were held in 2016 with a slight change in format with PhD students and senior researchers on alternating months. These sessions continue to be well attended.

The glaucoma course for upskilling of community optometrists continues. To date 8 optometrists have been credentialed.

Section 7 - Reviews

<table>
<thead>
<tr>
<th>Date of last review</th>
<th>August 2016</th>
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<tr>
<td>Review Recommendations</td>
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<tr>
<td>List the recommendations of the review and give an update of progress on addressing the recommendations.</td>
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</table>

1. Submission of an HRC programme grant – an off-site half day seminar is planned for April 2017 for all groups to meet and discuss NZ-NEC programme grant submission.

2. Role of Professor Steven Dakin need to be strengthened and clarified – Prof Dakin likely to take up co-vice chair of NZ-NEC and will be involved in management meetings. Any other involvement to be determined at next management meeting.

3. Increase participation of School of Optometry and Vision Science and Molecular Vision Laboratory within the Centre, to develop more collaborative research opportunities for the future – this will be discussed at meeting in March of management committee.
## Section 8 – FINANCIAL REPORT

<table>
<thead>
<tr>
<th>Description</th>
<th>NZ-NEC does not have its own cost centre</th>
</tr>
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<tbody>
<tr>
<td>State whether the Unit or Centre has its own Activity Centre/s and list the Activity Centre/s being used</td>
<td></td>
</tr>
<tr>
<td>State sources of funding, for example, from research funds from outside bodies, from the Department or Faculty, or other</td>
<td></td>
</tr>
<tr>
<td>List any significant resource allocation decisions taken by the Oversight Board during this reporting year (if applicable)</td>
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<tr>
<td>Include a statement of financial performance (contact Faculty Accountant for assistance), or give a clear explanation of the reasons if there has been no financial activity</td>
<td></td>
</tr>
</tbody>
</table>
## Section 9 – RESEARCH OUTPUTS

**Books/Book Chapters:**


Peer Reviewed Journal publications:


13


28. Naylor, RW; McGhee, CN J; Cowan, CA; Davidson, AJ; Holm, TM; Sherwin, T. Derivation of Corneal Keratocyte-Like Cells from Human Induced Pluripotent Stem Cells. PloS one 2016 11: e0165464

29. Mathan JJ, Ismail S, McGhee JJ, McGhee CNJ, Sherwin T. Sphere-forming cells from peripheral cornea demonstrate the ability to re-populate the ocular surface. Stem Cell Research and Therapy 2016 7(1).

30. Greene, CA; Green, CR; Dickinson, ME; Johnson, V; Sherwin, T. Keratocytes are induced to produce collagen type II: A new strategy for in vivo corneal matrix
regeneration. Experimental Cell Research 2016 347: 241-249


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<tbody>
<tr>
<td>43.</td>
<td>Wang MTM, Ganesalingam K, Loh CS, Alberquerque T, Al-Kanani S, Misra SL, Craig JP Compatibility of phospholipid liposomal spray use with silicone hydrogel contact lens wear; Contact Lens and Anterior Eye; 40 (1), 53-58</td>
</tr>
<tr>
<td>50.</td>
<td>Meyer JJ, Polkinghorne PJ, McGhee CN. Cataract</td>
</tr>
</tbody>
</table>


62. BISHT R, MANDAL A, RUPENTHAL ID, MITRA AK (2016) Ex vivo investigation of ocular tissue distribution following intravitreal administration of connexin43 mimetic peptide using the microdialysis technique and LCMS/MS, Drug Delivery and Translational Research, 6(6): 763-770 IF 1.887, 0/0 citations


64. RAMTIN A, SEYFODDIN A, COUTINHO FP, WATERHOUSE GIN, RUPENTHAL ID, SVIRSKIS D (2016) Cytotoxicity considerations and electrically tunable release of dexamethasone from polypyrrole for the treatment of back-of-the-eye conditions, Drug Delivery and Translational Research, 6(6): 793-799 IF 1.887, 0/0 citations


67. LIAN J, AGBAN Y, RAUDSEPP A, WILLIAMS MAK, RUPENTHAL ID, HENNING A, CHEONG S, TILLEY RD, AHN M,
HOLMES G, PRABAKAR S (2016) PVP/ZnO Quantum dots and their interaction with Type I collagen, European Polymer Journal, 75: 399-405 IF 3.242, 1/1 citations


72. Florey J, Clifford CWG, Dakin S, Mareschal I (2016), Spatial limitations in averaging social cues, Scientific Reports, 6:32210

73. Guo CX, Mat Nor MN, Danesh-Meyer HV, Vessey KA, Fletcher EL, O'Carroll SJ, Acosta ML, Green CR (2016), Connexin43 Mimetic Peptide Improves Retinal Function and Reduces Inflammation in a Light-Damaged Albino Rat Model, Investigative Ophthalmology & Visual Science, 57 (10):3961-


related macular degeneration measured using a novel high-pass letter chart, The British Journal of Ophthalmology, 100 (10): 1346052


78. Dakin SC, Turnbull PRK (2016), Similar contrast sensitivity functions measured using psychophysics and optokinetic nystagmus, Scientific Reports, 6:34514


83. Erkelens IM, Thompson B, Bobier WR (2016), Unmasking the linear behaviour of slow motor adaptation to prolonged convergence, European Journal of Neuroscience, 43 (12): 1553-60


86. Connell CJ, Thompson B, Kuhn G, Claffey MP, Duncan S, Gant N (2016), Fatigue related impairments in oculomotor control are prevented by caffeine, Scientific Reports, 6: 26614


Nursing Review, February, Vol 16 (1)


Please forward your report to your Head of Department or Faculty Office for endorsement (Section 1B above). Note: Annual Reports to be submitted to Research Committee must reach the Research Office by 28 February.