

Tuesday, 15 November, 19:30 – 22:00

Members' Salon, European Parliament, Brussels

*In cooperation with
the Delft University of Technology / QUTech*



An invitation and a draft agenda will follow soon.

Contact Info:

Square de Meeûs 35, 1000 Brussels, Belgium

Tel : 0032 (0) 5.1.2.e [redacted] (contact person: 5.1.2.e [redacted])

E-mail: [redacted]@knowledge4innovation.eu



Copyright © 2016 Knowledge4Innovation

[View in browser](#) | [Unsubscribe](#)

Ministerie van OCW	
Zaaknr	[REDACTED]
Datum reg	18 NOV. 2016
E-Doorn	[REDACTED]
Overna	OWB

1. M

2. OGHWE

3. OWB

I.S.M. HOBBS

5.1.2e



Organisatie voor Wetenschappelijk Onderzoek

59

Ministerie van Onderwijs, Cultuur en Wetenschap
 Dr. M. Bussemaker
 Postbus 16375
 2500 BJ 'S-GRAVENHAGE

Datum: 16 november 2016
 Dossiernr: 024.000.101.00
 Correspondentienr: 2016/BOO/00154966
 Telefoon: +31 70 5.1.2e
 E-mail: 5.1.2e@nwo.nl

Vermeld in uw antwoord datum, dossier- en
 correspondentienummer

Betreft: Advies voortzetting financiering projecten Zwaartekracht ronde 2012

Geachte mevrouw Bussemaker,

NWO voert op verzoek van OCW het programma Zwaartekracht uit, inclusief de monitoring en evaluatie van toegekende projecten. Onderdeel daarvan is een tussenevaluatie van de Zwaartekrachtprojecten op basis waarvan u kunt besluiten over voortzetting van de financiering voor een tweede termijn van vijf jaar. Inmiddels heeft de tussenevaluatie plaatsgevonden van de eerste zes consortia, die in de ronde van 2012 zijn toegekend. De consortia hebben zichzelf geëvalueerd en een externe evaluatiecommissie heeft de voortgang beoordeeld.

Met genoegen bied ik u hierbij het advies van de evaluatiecommissie aan.

Voor de tussenevaluatie heeft NWO een evaluatiecommissie ingesteld met onafhankelijke leden die goed weten wat het besturen van dergelijke grote consortia inhoudt en die goed zicht hebben op het Nederlandse wetenschapsbestel. Deze commissie had tot taak het Algemeen Bestuur van NWO te adviseren omtrent de stand van zaken bij de consortia en de vraag of voortzetting van de financiering voor een tweede termijn van vijf jaar op basis daarvan voor de hand ligt. De commissie heeft zich een beeld gevormd van de voortgang van de projecten op basis van de subsidieaanvragen, de zelfevaluaties en een evaluatiebijeenkomst waarbij de evaluatiecommissie met projectleiders en managing directors van de projecten heeft gesproken, en waarbij de zes consortia elk een presentatie hebben gehouden. De consortia en de penvoerende Colleges van Bestuur zijn in de gelegenheid gesteld om te reageren op eventuele feitelijke onjuistheden. De commissie heeft haar advies, met mondelinge toelichting door de commissievoorzitter em. prof. dr. S.W.J. Lamberts, aangeboden aan het Algemeen Bestuur van NWO.

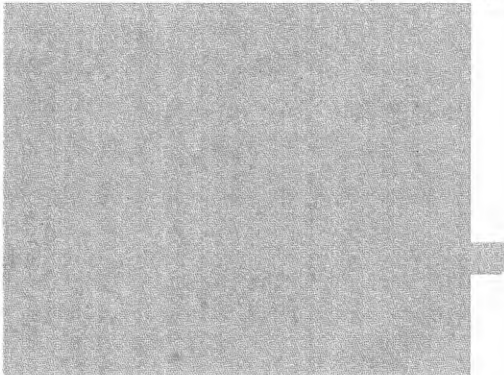
Het Algemeen Bestuur heeft het advies van de commissie overgenomen inclusief de aanbevelingen. Het advies aan u is de financiering van alle zes de consortia te continueren voor de tweede periode van vijf jaar en de zes consortia te verzoeken over één jaar aan de Raad van Bestuur van NWO te rapporteren over de voortgang van de implementatie van de aanbevelingen van de evaluatiecommissie.

Laan van Nieuw Oost-Indië 300, 2593 CE Den Haag
 Postbus 93510, 2509 AM Den Haag
 www.nwo.nl

IBAN: NL89ABNA0642330824, BIC ABNANL2A
 ABN AMRO, Rotterdam 64 23 30 824
 KvK Den Haag 27367015, BTW [REDACTED]

Een bijzonder aandachtspunt van de evaluatiecommissie is het volgende. Een aantal consortia maakt gebruik van longitudinale cohorten (observationeel onderzoek waarbij herhaaldelijk en systematisch, gedurende een lange periode in steeds dezelfde groep proefpersonen metingen worden verricht om ontwikkelingen in kaart te brengen). De Nederlandse wetenschap staat internationaal bekend om haar unieke en kwalitatief hoogstaande cohortstudies vanwege de systematische aanpak, het onderhoud en de lange looptijd. Tezamen met de sterk ontwikkelde epidemiologische kennis in Nederland, vormen deze cohorten een zeer geschikte basis voor internationale onderzoekssamenwerking. De evaluatiecommissie zou het ministerie van OCW willen adviseren om op centraal niveau na te denken over borging van deze longitudinale (zeer langlopende) cohortstudies, omdat het kwetsbaar is deze te beleggen op universitair instellingsniveau vanwege de kosten en het onderhoud. Het Algemeen Bestuur van NWO steunt dit advies.

In het gesprek dat het bestuur van NWO heeft gehad met de evaluatiecommissie, zijn een aantal punten ter sprake gekomen die van belang kunnen zijn voor toekomstige Zwaartekrachtrondes en met name voor het borgen van de wetenschappelijke resultaten van deze programma's in de toekomst. Graag zou ik deze punten samen met het advies en het evaluatierapport mondeling aan u toelichten.



Bijlage:

- Report Committee for the Midterm Evaluation Gravitation projects 2012

cc:

- HO&S en OWB



Report

Comm

for the

C

Contents

Managementsamenvatting	5
Executive summary	15
1 Gravitation	25
1.1 Aim of the programme	25
1.2 Midterm evaluation	25
1.3 Design of the evaluation	26
2 Committee review	29
2.1 Procedure	29
2.2 Overall conclusion	29
2.3 General remarks on Gravitation	31
3 Committee reviews per research consortium	33
3.1 Consortium on Individual development (CID): Why some children thrive and others do not	33
3.1.1 Introduction	33
3.1.2 The committee's comments and criticisms	34
3.2 Language in Interaction Consortium (Lil)	37
3.2.1 Introduction	37
3.2.2 The committee's comments and criticisms	38
3.3 Delta-Institute for Theoretical Physics (Delta ITP)	41
3.3.1 Introduction	41
3.3.2 The committee's comments and criticisms	42
3.4 CancerGenomiCs Netherlands (CGC.nl)	45
3.4.1 Introduction	45
3.4.2 The committee's comments and criticisms	46
3.5 Frontiers of Nanoscience (NanoFront)	49
3.5.1 Introduction	49
3.5.2 The committee's comments and criticisms	51
3.6 Research Center for Functional Molecular Systems (FMS)	53
3.6.1 Introduction	53
3.6.2 The committee's comments and criticisms	55
Appendix 1: Terms of Reference midterm evaluatie Zwaartekracht projecten call 2012	59
Appendix 2: Template midterm self-evaluation Gravitation projects call 2012	63
Appendix 3: CV Members of the Committee for the Midterm Evaluation of the Gravitation projects 2012	69
Appendix 4: Programme evaluation meeting Gravitation projects call 2012	71
Appendix 5: Organograms, research leaders and members scientific advisory board	73

Managementsamenvatting

Met het programma Zwaartekracht stimuleert de overheid innovatief onderzoek in Nederland. Het is bedoeld voor wetenschappelijke consortia die de wereld willen helpen om tot de wereldtop op hun gebied te gaan behoren. Het is een financiering uit de eerste geldstroom (direct via de Rijksoverheid). Het ministerie van Onderwijs, Cultuur en Wetenschappen (OCW) heeft NWO bevestigd de selectieprocedure voor Zwaartekrachtprojecten.

Dit rapport is de weerslag van de midterm evaluatie van de eerste zes Zwaartekrachtprojecten, die zijn gehonoreerd in de eerste financieringsronde in 2012. Aanleiding voor de evaluatie was de wens van de opdrachtgever, het ministerie van OCW, om van NWO vier jaar na de start van de projecten een tussenevaluatie te ontvangen. Op basis van deze evaluatie en het advies van het Algemeen Bestuur van NWO daarover neemt de minister van OCW een besluit over het al dan niet continueren van de financiering van de projecten voor een tweede periode van wederom vijf jaar. Het betreft de volgende projecten:

5.1.2e		Naam project	Startdatum
024.001.027		"Delta-Institute for Theoretical Physics: Matter at all Scales"	1-5-2013
024.001.031		"Frontiers of Nanoscience (NanoFront)"	1-1-2013
024.001.035		"Research Centre for Functional Molecular Systems"	1-2-2013
024.001.006		"Language in Interaction"	1-7-2013
024.001.003		"Individual development: Why some children thrive, and others don't"	1-5-2013
024.001.028		"Cancer Genomics Centre Netherlands (CGC.nl)"	1-1-2013

Een nationaal samengestelde commissie heeft de kwaliteit van de uitwerking van het ingediende onderzoeksprogramma getoetst (zie bijlage 3). Zijn de projecten goed uit de startblokken en op stoom gekomen? Wordt aan de randvoorwaarden voldaan om deze projecten tot een succes te brengen? De volgende criteria werden hierbij gehanteerd: 1. Deelnemende onderzoekers, 2. Kwaliteit onderzoekslijnen, 3. Institutionele en organisatorische inbedding, 4. Realisatie en begroting en 5. Kennisbenutting. Het was in deze fase niet de taak van de commissie om de wetenschappelijke voortgang en kwaliteit van de consortia te beoordelen.

De evaluatiecommissie heeft zich een oordeel gevormd op basis van door de consortia aangeleverde beknopte zelfevaluaties en een evaluatiebijeenkomst op 6 en 10 juni 2016, waar de consortia een presentatie hebben gegeven en waar de commissie gesprekken heeft gevoerd met maximaal vier personen per consortium, waaronder in elk geval de wetenschappelijk directeur en managing director. De commissie heeft ook de beschikking gehad over de oorspronkelijke onderzoeksplannen van de consortia.

Advies

Op basis van de zelfevaluaties, de presentaties van de consortia en de interviews met het management van de consortia constateert de commissie dat elk van de consortia aan alle evaluatiecriteria voldoet. Daarom adviseert de commissie de financiering van alle zes de consortia te continueren voor de tweede periode van vijf jaar. Wel heeft zij voor alle consortia een aantal aanbevelingen. De commissie adviseert dat de consortia na één jaar rapporteren aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

Algemene conclusies

De commissie is tot de volgende algemene conclusies gekomen.

Toegevoegde waarde Zwaartekrachtfinanciering

De evaluatiecommissie is van mening dat de Zwaartekrachtfinanciering bij de betrokken consortia het cement vormt dat de variaties in het spectrum van kennis rondom expertisegerieden verbindt met als doel echte innovatie en risicovolle projecten te starten en uit te voeren. Het is de basis en de katalysator. In het huidige universitaire bekostigingssysteem (door verkleining van de 1^e geldstroom en veel vaststaande deliverables via de 2^{de} geldstroom) is de flexibiliteit namelijk voor een groot deel verloren gegaan, waarmee de vrijheidsgraden van het uitvoeren van wetenschappelijk onderzoek ingeperkt worden om in te springen op nieuwe ontwikkelingen en inzichten. Dankzij de Zwaartekrachtsubsidie is het toch mogelijk om high level innovatief onderzoek met een relatief hoog risico uit te voeren (high risk high gain). Tevens biedt het mogelijkheden om (nationale en internationale) toptalenten aan te trekken en hen kansen te geven zichzelf ten volle te ontwikkelen.

De toegevoegde waarde van het Zwaartekrachtprogramma bij consortia die al veel financiering ontvangen lijkt minder duidelijk. Deze consortia gaan veelal door op het ingeslagen pad, en hebben zelf ook moeite om de additionele waarde van de Zwaartekrachtfinanciering precies aan te geven, anders dan continuering van bestaande excellente onderzoekslijnen.

Samenwerking Deelnemende onderzoekers

De kwaliteit van de deelnemende groepen in de consortia is zonder meer uitstekend. De mate van actieve participatie van de verschillende groepen in de verschillende consortia wisselt wel eens. Sommige consortia bezitten voldoende adaptief vermogen om daar consequenties uit te trekken. De commissie heeft een mooi voorbeeld gezien van het vermogen van de consortia om afscheid te nemen van onderzoekers die in de praktijk om diverse redenen minder betrokken bleken.

Over het algemeen is de commissie tevreden over de invulling van de vacatures. De consortia zijn er over het algemeen in geslaagd om toptalenten en toponderzoekers aan te trekken. Een indrukwekkend voorbeeld en best practice in het aantrekken van toptalenten en daarmee een investering in de toekomst vindt de commissie het verschaffen van een "startpakket" aan zorgvuldig geselecteerde toponderzoekers (PI's), bestaande uit een PhD student, een postdoc en ruim materieel budget, om een laboratorium op te zetten. Door middel van vaste en/of tenure track posities slagen Consortium Individual Development (CID), Delta-Institute for Theoretical Physics (Delta ITP), Language in Interaction (Lil) en Frontiers of Nanoscience (NanoFront), in het creëren van een zekere verankering binnen de betreffende universiteiten. Research Center for Functional Molecular Systems (FMS) slaagt hier ook in, ook al vallen de tenure track posities niet onder de Zwaartekrachtmiddelen.

Het valt op dat bij de consortia (CancerGenomics Netherlands CGC.nl) die minder ruimte bieden aan "mid career" (30-40 jaar) onderzoekers om zich verder te ontwikkelen, er een gat dreigt te ontstaan tussen de echt jonge onderzoekers en de 40-50 plussers door vertrek van de tussenlaag.

Hoewel geen beoordelingscriterium bij de evaluatie constateert de commissie dat de consortia verschillend omgaan met genderdiversiteit. Over het algemeen werken er meer mannelijke dan vrouwelijke onderzoekers bij de consortia, behalve bij het CID. Sommige consortia voeren met succes genderspecifiek beleid bij het werven van onderzoekers, terwijl het onderwerp voor andere consortia minder prioriteit heeft.

Evaluatie van de kwaliteit onderzoekslijnen

De commissie doet de observatie dat de individuele leden van de consortia vaak los van elkaar starten, en pas na een aantal jaar de noodzaak van meer interactie inzien. In sommige gevallen komterschikking van de verschillende groepen tot stand, in andere gevallen blijkt dat niet goed te realiseren.

Vaak zijn de consortia niet evenwichtig samengesteld en domineert één groep of universiteit. Het bereiken van een goede interactie tussen verschillende groepen en disciplines is lastig. Hiervoor is een cultuuromslag nodig en sommige consortia slagen daar beter in dan andere. Vooral als een consortium sterk wordt gedomineerd door één groep is het lastig. De commissie is van mening dat onderzoekers eerst het eigen vak dienen te beheersen en daarin sterk dienen te staan alvorens de waarde van andere disciplines te kunnen zien en te kunnen integreren in het eigen onderzoek. De commissie ziet de oplossing voor het realiseren van interdisciplinariteit in onderzoek in "team science", dat wil zeggen de gezamenlijke inspanning van experts uit verschillende vakgebieden om complexe wetenschappelijke uitdagingen op te pakken. Een aantal consortia werkt al op deze manier, de onderzoekers reizen heen en weer tussen de verschillende instituten en expertise groepen. De commissie erkent overigens dat deze modus operandi tijd nodig heeft.

Organisatorische aansturing van de consortia

Over het algemeen is de organisatorische aansturing van de consortia belegd bij een relatief smalle top, die zich laat adviseren door de prominente onderzoekers uit de consortia. Vaak is er sprake van een externe (internationale) Scientific advisory board, die een wisselende invloed heeft op strategie en beleid.

Jonge onderzoekers (PhD studenten, post-docs) in de eerste jaren van hun wetenschappelijke carrière, lijken nauwelijks bij de organisatie van de projecten te worden betrokken. Zelfs PI's – op toch al wat meer senior posities – zijn in geen enkele Executive Board vertegenwoordigd.

Voor het opleiden van een nieuwe generatie onderzoekers wordt over het algemeen gebruik gemaakt van bestaande curricula waar de consortia soms nog enkele extra elementen aan toe voegen. Sommige consortia hebben in woord steun van de betrokken universiteiten voor verankering na afloop van de looptijd van het Zwaartekrachtprogramma. Financiële toezeggingen worden er echter niet gedaan. Wel zijn in een aantal gevallen enkele PI's op vaste posities en tenure track posities aangenomen, met een financiële garantie voor de periode na afloop van de zwaartekrachtfinanciering. Een aantal consortia maakt gebruik van longitudinale cohorten. De commissie adviseert het ministerie van OCW om op centraal niveau na te denken over borging van deze longitudinale (zeer langlopende) cohortstudies, omdat het kwetsbaar is deze te beleggen op universitair instellingsniveau.

Bestedingspatroon en kwaliteit

De consortia hebben over het algemeen in aanvang een wat langzaam bestedingspatroon. Enerzijds is dit te verklaren doordat consortia niet direct na honorering eind 2012 van start konden gaan, terwijl de eerste tranche wel reeds in 2012 werd overgemaakt. Anderzijds gaan de consortia zeer zorgvuldig te werk bij de selectie van talentvolle onderzoekers. In dat geval is een langzaam bestedingspatroon een teken van kwaliteit. Een nadeel van een voortvarend bestedingspatroon en vroegtijdige allocatie is volgens de commissie reductie van de flexibiliteit om op nieuwe ontwikkelingen in te spelen gedurende de looptijd van het project.

Evaluatiecriterium 5: Kennisbenutting

Kennisbenutting komt in de zelfevaluaties relatief weinig aan bod. Het gaat in de zelfevaluaties vooral over kennisbenutting door de wetenschap zelf, te weten het opleiden van nieuwe talenten. Daarnaast heeft een aantal consortia apps ontwikkeld. Van patenten, startups, coachingstrajecten of betrokkenheid van stakeholders is nauwelijks sprake, ook niet in meer op toepassing gerichte programma's. Een positieve uitzondering is de industry advisory council bij het consortium Delta ITP. Er wordt door de consortia wisselend voorgesorteerd op de Nationale Wetenschapsagenda. De consortia kunnen nog verdere stappen op het gebied van kennisbenutting zetten in lijn met de missie van het ministerie van OCW en NWO om contacten tussen (potentiële) bedrijven en wetenschap te stimuleren.

Om die reden heeft de commissie aan alle consortia als aandachtspunt meegegeven dat er door het management meer gestuurd kan worden op publiek-private samenwerking en op publiek-publieke samenwerking. Op deze wijze zou nog meer vorm en inhoud gegeven kunnen worden aan de doelstelling van het Zwaartekrachtprogramma, namelijk dat de selectie van excellente consortia leidt tot profilering van universitair toponderzoek dat bijdraagt aan de taakopdracht van de topsectoren en tegemoet komt aan de Grand Challenges van de EU Kaderprogramma's.

Aanbevelingen per consortium

Consortium Individual Development (CID)

Continuering van financiering

De commissie stelt vast dat CID goed op weg is om de vastgelegde doelen binnen de Zwaartekracht-financiering te behalen. Daarom is de commissie van mening dat het consortium ook de volgende vijf jaar dient te worden gefinancierd. Wel heeft zij voor CID een aantal aanbevelingen.

De commissie adviseert om:

- **meer flexibiliteit in te bouwen ten behoeve van de sturingsmogelijkheid in de tweede termijn**
De tweede vijf jaar lijkt de invulling van vacatures min of meer vast te liggen. Er is immers gekozen voor een aantal cohortonderzoeken waarvan de onderzoeksmethodologie zo goed als vastligt. Daardoor is er betrekkelijk weinig sturingsmogelijkheid voor de tweede termijn. Ook al is uniformiteit en continuïteit de kracht van longitudinaal onderzoek waarbij na langere tijd pas de meest waardevolle resultaten worden behaald. Doordat alle PI's zich schriftelijk hebben geconformeerd aan een gedetailleerd consortium agreement is de sturingsmogelijkheid ook beperkter. Dit vindt de commissie een minder gelukkige uitkomst. De commissie adviseert CID derhalve om meer flexibiliteit in te bouwen ten behoeve van de sturingsmogelijkheden in de tweede termijn. Het consortium zou bijvoorbeeld de stevige basis van CID kunnen gebruiken om externe financiering aan te vragen waarmee innovatie en flexibiliteit nagestreefd wordt.
- **de consortia CID en Language in Interaction (Lil) verder te laten verkennen in welke mate het nuttig is om zowel wetenschappelijke als organisatorische inzichten collegiaal met elkaar te delen**
Cross-overs met aanpalende wetenschapsgebieden en Zwaartekrachtprogramma's zijn er nog té weinig. De commissie onderstreept het belang van de mogelijke samenwerking ook tussen Zwaartekrachtprogramma's en adviseert de consortia CID en Lil om verder te verkennen in welke mate het nuttig is om zowel wetenschappelijke als organisatorische inzichten collegiaal met elkaar te delen.
- **de mogelijkheden voor de toepassingsmogelijkheden en valorisatie van geanonimiseerde data collecties te onderzoeken**
De commissie is van mening dat CID de valorisatiemogelijkheden van de data die het genereert onderschat. Deze geanonimiseerde data kan voor allerlei partijen interessant zijn. Het consortium

heeft op dit moment nog weinig oog voor deze mogelijkheden. De commissie geeft het consortium in overweging om toch naar de bestaande en in ontwikkeling zijnde business modellen van data- en biobanken van cohorten te kijken.

Daarnaast adviseert de commissie met betrekking tot de facultatieve onderwerpen (genderdiversiteit, datamanagement en ethiek) om:

- **extern advies in te winnen en expertise te integreren rondom shared data management**

De scientific advisory board (SAB) heeft nog niet veel invloed op de gekozen weg en lijkt ook wat betreft beoordeling van de shared datamanagement een verdiepingsslag te kunnen maken. De commissie vindt het wenselijk dat het consortium rondom shared datamanagement nog meer expertise aantrekt, om dit professioneel op te zetten en daarmee optimale benutting van de vergaarde onderzoeksresultaten te bereiken. Bijvoorbeeld middels een gerenommeerde dataexpert, bij voorkeur op het gebied van het koppelen en analyseren van gegevens binnen en tussen cohortstudies.

Verder adviseert de commissie dat CID na één jaar rapporteert aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

Angewijzen interactie Lil

Continuïteit Lil

De commissie stelt vast dat de Lil goed op weg is om de vastgelegde doelen binnen de Zwaartekracht-financiering te behalen. Daarom is de commissie van mening dat het consortium ook de volgende vijf jaar dient te worden gefinancierd. Wel heeft zij voor Lil een aantal aanbevelingen.

De commissie adviseert om:

- **de consortia Lil en CID verder te laten verkennen in welke mate het nuttig is om zowel wetenschappelijke als organisatorische inzichten collegiaal met elkaar te delen**

Cross-overs met aanpalende wetenschapsgebieden en Zwaartekrachtprogramma's zijn er nog te weinig. De commissie onderstreept het belang van de mogelijke samenwerking ook tussen Zwaartekrachtprogramma's en adviseert de consortia Lil en CID om verder te verkennen in welke mate het nuttig is om zowel wetenschappelijke als organisatorische inzichten collegiaal met elkaar te delen.

Daarnaast adviseert de commissie met betrekking tot de facultatieve onderwerpen (genderdiversiteit, datamanagement en ethiek) om:

- **in de tweede helft van de Zwaartekrachtsubsidie een gedetailleerd plan op het gebied van data-management te ontwerpen (FAIR data) waarbij ook de expertise van het Max Planck Instituut wordt gebruikt**

De commissie is er niet van overtuigd dat het management van massale data reeds goed genoeg geborgd is, zowel qua analyse als qua expertise en veiligheid. Data-integratie, het met elkaar verbinden van formats en dergelijke, resulteert in een grote hoeveelheid data. De commissie meent dat Lil onderschat hoeveel tijd en energie er is gemoeid met goed datamanagement, dat wil zeggen het FAIR data maken van: Findable, Accessible, Interoperable en Reusable.

Verder adviseert de commissie dat Lil na één jaar rapporteert aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

Delta-Institute for Theoretical Physics (Delta ITP)

Continuering van financiering

De commissie stelt vast dat de Delta ITP goed op weg is om de vastgelegde doelen binnen de Zwaarte-krachtfinanciering te behalen. Daarom is de commissie van mening dat het consortium ook de volgende vijf jaar dient te worden gefinancierd. Wel heeft zij voor Delta ITP een aantal aanbevelingen.

De commissie adviseert om:

- **de verantwoordelijkheden tussen de diverse gremia intern scherper af te stemmen**

De commissie constateert dat de verantwoordelijkheden tussen de diverse gremia niet altijd duidelijk zijn en dat er een spanningsveld blijft bestaan tussen de verantwoordelijkheden van het consortium en de deelnemende universitaire instituten (instituutshoofden, faculteiten, decanen). De commissie adviseert om de verantwoordelijkheden tussen de diverse gremia intern scherper af te stemmen.

- **een scientific advisory board in te stellen**

Delta ITP is op basis van de externe review tot de conclusie gekomen dat er dringend behoefte is aan een scientific advisory board om de voortgang en kwaliteit te valideren door de jaarlijkse Delta ITP review en budget goed te keuren. Deze taak werd tot nog toe door de supervisory board vervuld, maar het is wenselijk om deze taken en verantwoordelijkheden door een onafhankelijk gremium te laten vervullen.

- **in de toekomst versterking van de industry advisory council na te streven in het kader van de invulling van de samenwerking met de experimentele fysica**

De commissie is van mening dat samenwerking met de experimentele fysica al wel aan de orde is maar nog onvoldoende wordt ingevuld. Hier ziet de commissie een taak voor de industry advisory council, die kan meedenken over de invulling. Samenwerking kan leiden tot de koppeling van twee Zwaartekrachtprojecten (Delta ITP en NanoFront). In dit kader adviseert de commissie om in de toekomst versterking van de industry advisory council na te streven, die momenteel bestaat uit oud-fysici uit het netwerk van de leden van het consortium. Te denken valt aan bedrijven zoals Philips, ASML, NXP, DSM, etc.

- **erop toe te zien dat PhD studenten door beide begeleiders in gelijke mate worden aangestuurd**

PhD posities worden geformuleerd door onderzoekers van verschillende instituten. In de praktijk blijken de aangestelde PhD studenten door één begeleider te worden aangestuurd met slechts een betrekkelijk geringe bijdrage van de onderzoeker uit een ander instituut. Dit zou volgens de commissie juist voor de theoretische natuurkunde een gemiste kans kunnen zijn. Zij adviseert het consortium dan ook om erop toe te zien dat PhD studenten door beide begeleiders in gelijke mate worden aangestuurd.

- **samenwerking in Europese projecten na te streven**

De internationale samenwerking bestaat nu voornamelijk uit het internationaal werven van onderzoekers, het fellowship-programma en een uitgebreid bezoekersprogramma waarbij world-leading experts het consortium bezoeken voor kortere of langere periode. De commissie suggereert Delta ITP om zich ook te positioneren voor participatie in Europese projecten.

Verder adviseert de commissie dat Delta ITP na één jaar rapporteert aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

LancerGenomics Consortium (CGC.nl)

Continuïteit en financiering

De commissie stelt vast dat de CGC.nl goed op weg is om de vastgelegde doelen binnen de Zwaarte-krachtfinanciering te behalen. Daarom is de commissie van mening dat het consortium ook de volgende vijf jaar dient te worden gefinancierd. Wel heeft zij voor CGC.nl een aantal aanbevelingen.

De commissie adviseert om:

- **enige flexibiliteit in de budgettering te creëren om jonge PI's te identificeren**

De commissie merkt op dat de budgettering grotendeels al is ingepland en dat dit de flexibiliteit om jonge PI's te identificeren en in te zetten niet ten goede komt. Zij adviseert om toch enige flexibiliteit te creëren en suggereert verder om door middel van start-up pakketten en tenure tracks voor een beperkt aantal meest veelbelovende onderzoekers de volgende generatie(s) toponderzoekers te creëren, naast de activiteiten die al binnen de deelnemende instituten op dit gebied plaatsvindt.

- **in te zetten en meer verantwoordelijkheid te nemen voor de carrièreperspectieven van jonge talenten**

De commissie maakt zich zorgen over de hoge drop-out-rates van getalenteerde junior onderzoekers vanwege het onzekere carrièreperspectief in een zeer concurrerende omgeving met een sterk hiërarchisch karakter. Zij adviseert het consortium meer verantwoordelijkheid te nemen voor de carrièreperspectieven van jonge talenten. Er dreigt nu een gat te ontstaan tussen de jongere onderzoekers en de senior trekkers, doordat de postdocs vertrekken om elders tot verdere ontwikkeling te komen.

- **het aantal meetings te intensiveren en interactiever te maken**

De commissie adviseert het consortium om het aantal interne meetings binnen het consortium te intensiveren teneinde de interactie tussen de disciplines te bevorderen: in plaats van één jaarlijkse meeting minimaal eens per drie maanden. Ook zou de interactie verder bevorderd kunnen worden, door het format van de meetings interactiever te maken en minder te richten op presenteren van voortgang.

- **meer klinici te betrekken bij het bepalen van de richting van het onderzoeksprogramma**

Ter bevordering van de kennisbenutting adviseert de commissie meer klinici te betrekken bij het bepalen van de richting van het onderzoeksprogramma, en de praktische/financiële consequenties door te denken van therapieën met mogelijk een sequentie van meerdere (dure) medicijnen. Deze vraagstelling vereist een adaptief vermogen bij de onderzoeksleiders, om zich meer te richten op toepasbaarheid van modellen en onderzoeksresultaten in de toekomstige klinische praktijk.

- **niet-passende of niet-actieve groepen al in dit stadium te identificeren en passende maatregelen te nemen binnen de mogelijkheden**

Niet alle groepen zijn in dezelfde mate verbonden met CGC.nl. Volgens het consortium is het momenteel nog lastig om een selectie te maken. De commissie adviseert CGC.nl om toch al in dit stadium een poging te doen om niet betrokken consortium leden te activeren, of, als dat niet lukt, de budget verdeling aan te passen, voor zover dat mogelijk is binnen de toegezegde kaders.

Daarnaast adviseert de commissie met betrekking tot de facultatieve onderwerpen (genderdiversiteit, datamanagement en ethiek) om:

- **het probleem van de gender balance blijvend op de agenda te zetten teneinde meer gender balance te creëren**

Tevens valt het de commissie op dat de bijdrage van vrouwen in de toplagen van dit consortium en daaronder uiterst beperkt is. De commissie vraagt hier aandacht voor. Er is ruim voldoende vrouwelijk talent beschikbaar, zeker internationaal gezien, binnen het betreffende vakgebied.

- **het datamanagement tenminste wat betreft de randvoorwaarden volgens het FAIR (Findable, Accessible, Interoperable en Reusable) principe te organiseren**

Er bestaat geen centraal datamanagementbeleid. Het consortium geeft aan de data beleidsplannen van de gastinstituten te gaan volgen om een goed beheer van data te bereiken. De commissie vindt dat het datamanagement op deze manier niet goed geregeld is en adviseert dit tenminste wat betreft de randvoorwaarden volgens het FAIR (Findable, Accessible, Interoperable en Reusable) principe te doen.

Verder adviseert de commissie dat CGC.nl na één jaar rapporteert aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

Frontiers of Nanoscience (NanoFront)

Continuering van financiering

De commissie stelt vast dat de NanoFront goed op weg is om de vastgelegde doelen binnen de Zwaarte-krachtfinanciering te behalen. Daarom is de commissie van mening dat het consortium ook de volgende vijf jaar dient te worden gefinancierd. Wel heeft zij voor NanoFront een aantal aanbevelingen.

De commissie adviseert om:

- **een industry advisory board in te stellen**

Over de suggestie van de commissie om naar analogie van het consortium Delta ITP een industry advisory board in te stellen werd door NanoFront anders gedacht, omdat de individuele onderzoekers al hun eigen discipline-specifieke netwerk in de industrie hebben. Als prominent voorbeeld werd QuTech genoemd, een geavanceerd onderzoekscentrum van NanoFront- onderzoekers met partners uit de industrie: TNO, Intel en Microsoft.

Een dergelijk orgaan kan het MT adviseren over opportuniteiten binnen het bedrijfsleven die specifiek binnen het interessegebied van NanoFront liggen. Daarom adviseert de commissie om een industry advisory board in te stellen om de contacten met het bedrijfsleven te formaliseren en op die manier ook de kennisbenutting mede te optimaliseren.

- **de mogelijkheid tot interdisciplinaire samenwerking optimaal te benutten**

Hoewel het om een interdisciplinair onderzoeksprogramma gaat, lijken afzonderlijke projecten niet volledig de mogelijkheid tot interdisciplinaire samenwerking te benutten die binnen dit consortium mogelijk is.

Verder adviseert de commissie dat NanoFront na één jaar rapporteert aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

Research Center for Functional Molecular Systems (FMS)

Continuering van financiering

De commissie stelt vast dat de FMS goed op weg is om de vastgelegde doelen binnen de Zwaartekrachtfinanciering te behalen. Daarom is de commissie van mening dat het consortium ook de volgende vijf jaar dient te worden gefinancierd. Wel heeft zij voor FMS een aantal aanbevelingen.

De commissie adviseert om:

- **samenwerking in Europese projecten na te streven**

De drie betrokken instituten zijn instituten van wereldniveau, ze hebben een erkende internationale toppositie. Het FMS consortium heeft op internationaal niveau veel te bieden: internationale samenstelling, organiseren van internationale symposia en workshops en het aantrekken van internationale toponderzoekers. Nederland voorziet voor dit toptalent in een zeer geschikte plek om wetenschappelijk onderzoek te doen in een baanbrekende wetenschappelijke omgeving. Het consortium plaatst zich via de drie betrokken instituten bovendien daardoor op de internationale banenmarkt. In dat licht valt op dat samenwerking op Europees niveau ontbreekt en de commissie adviseert dan ook de komende jaren meer aandacht aan te besteden aan de totstandkoming daarvan.

- **een industry advisory board in te stellen**

FMS heeft effectieve contacten en samenwerking met de industrie. Vanuit het bedrijfsleven is er nu meer zicht op het belang van dit vakgebied, mede dankzij de zichtbaarheid van het Zwaartekrachtconsortium en de 'next level in the area of functional molecular systems' waar men zich op kan focussen. Ook zijn FMS PI's betrokken bij het recent opgerichte Advanced Research Center Chemical Building Blocks Consortium (ARC CBBC) waarin AkzoNobel, BASF, Shell, het Ministerie van Economische Zaken, de Topsector Chemie, NWO en de universiteiten van Utrecht, Eindhoven en Groningen een meerjarig commitment hebben afgegeven. De commissie adviseert FMS in het licht hiervan een industry advisory board in te stellen om de contacten met het bedrijfsleven te formaliseren en op die manier de kennisbenutting mede te optimaliseren.

Verder adviseert de commissie dat FMS na één jaar rapporteert aan de raad van bestuur van NWO over de voortgang van de implementatie van de aanbevelingen van de commissie en dat deze voortgang bij de eindevaluatie nogmaals wordt getoetst.

Executive summary

The Dutch government is encouraging excellent research through the Gravitation programme. The programme is intended for scientific consortia that have the potential to become – or remain – the best in the world in their field. It involves money from the first flow of funds (directly from the federal government). The Ministry of Education, Culture and Science (Ministerie van Onderwijs, Cultuur en Wetenschappen – OCW) requested NWO to carry out the selection procedure for the Gravitation programme.

This report reflects the midterm evaluation of the first six Gravitation projects, which were awarded in the first funding round in 2012. The reason for the evaluation was OCW's wish to receive a midterm evaluation from NWO four years after the launch of the projects. Based on this evaluation, and the advice provided by NWO's governing board on the matter, the Minister of OCW will decide whether or not to prolong funding of the projects for a second five-year period. It involves the following projects:

File no.	Main applicant	Name project	Start
024.001.027	Prof. dr. E. P. Verlinde (UvA)	"Delta-Institute for Theoretical Physics: Matter at all Scales"	1-5-2013
024.001.031	Prof. dr. C. Dekker (TUD)	"Frontiers of Nanoscience (NanoFront)"	1-1-2013
024.001.035	Prof. dr. E.W. Meijer (TU/e)	"Research Centre for Functional Molecular Systems"	1-2-2013
024.001.006	Prof. dr. P. Hagoort (RUN)	"Language in Interaction"	1-7-2013
024.001.003	Prof. dr. C. Kemner (UU)	"Individual development: Why some children thrive, and others don't."	1-5-2013
024.001.028	Prof. dr. R. Bernards (UMCU)	"Cancer Genomics Centre Netherlands (CGC.nl)"	1-1-2013

A national committee has assessed the quality of the development of the submitted research programme (see appendix 3). Did the projects get off to a flying start and keep up the momentum? Are the preconditions that ensure the success of these projects being met? The following criteria were used to determine the answers to these questions: 1. Participating researchers, 2. Quality of the realisation of the research programme, 3. Institutional and organisational embedding, 4. Realisation and budget, and 5. Knowledge utilisation. It was not the committee's task at this stage to evaluate the scientific progress or quality of the consortia.

The evaluation committee made an appraisal based on the brief self-evaluations submitted by the consortia and the evaluation meetings that took place on 6 and 10 June 2016, during which the consortia made a presentation and the committee conducted talks with a maximum of four people from each consortium, including – in any case – the scientific director and the managing director. The committee also had access to the consortia's original research plans.

Recommendation

Based on the self-evaluations, the consortia's presentations and the interviews with the consortia's management, the committee concludes that each of the consortia has met all of the evaluation criteria. That is why the committee recommends that the funding of all six of the consortia be prolonged for a second five-year period. However, it does have several recommendations for the consortia. The committee recommends that the consortia report to the governing board of NWO after one year on the implementation of the committee's recommendations. This should also be included as an important element in the final review.

General conclusions

The committee has come to the following general conclusions.

Added value of Gravitation funding

The evaluation committee believes that the funding of the consortia through Gravitation is the cement that holds together the variations in the spectrum of knowledge entailed in their fields of expertise, with the aim of initiating and implementing truly innovative and high-risk projects. It is the foundation and the catalyst. Flexibility has largely been eliminated in the present university funding system (by reducing the first flow of funds and many fixed deliverables via the second flow of funds), which has restricted the freedom to carry out scientific research that responds to new developments and insights. Thanks to Gravitation funding it is nonetheless possible to conduct high-level, innovative research with a relatively high degree of risk (high risk, high gain). It also provides an opportunity to attract the most talented national and international researchers and give them a chance to fully develop themselves. The added value of the Gravitation programme for consortia that already receive substantial funding is less obvious. These consortia often continue down the same road and find it difficult to indicate exactly what the added value of the Gravitation funding is, other than to continue their pursuit of excellent lines of research.

Participating researchers

The quality of the participating groups in the consortia is certainly excellent. The degree of active participation by the different groups does vary sometimes. Some consortia have the ability to adapt and draw conclusions from the situation. The committee witnessed a good example of the ability of the consortia to say farewell to researchers who, for whatever reasons, turned out to be less involved than desired.

In general, the committee is satisfied with how the vacancies were filled. The consortia have generally succeeded in attracting top talents and researchers. An impressive example and best practice in attracting top talents and hence an investment in the future, according to the committee, is the provision of a 'start-up package' for the carefully selected principal investigators (PIs), consisting of a PhD student, a postdoc and a substantial material budget, in order to set up a laboratory. Tenure track positions and/or permanent positions have enabled Consortium Individual Development (CID), Delta-Institute for Theoretical Physics (Delta ITP), Language in Interaction (Lil) en Frontiers of Nanoscience (NanoFront) to successfully anchor themselves in the universities in question. Research Center for Functional Molecular Systems (FMS) has also succeeded in doing this, even though the tenure track positions are not part of the Gravitation funding instrument.

It is worth noting that in consortia with less space for people in their mid-career (30–40 years old) to develop themselves, a gap could potentially emerge between the really young researchers and those in the age group of 40–50 years and older as the middle layer departs (e.g. CancerGenomiCs Netherlands, CGC.nl).

Although it was not an evaluation criterion during the evaluation, the committee observed that the consortia handle gender diversity in different ways. In general, more male than female researchers work at the consortia, except at CID. Some consortia have successfully implemented a gender-specific policy while recruiting researchers, whereas the issue is less of a priority for other consortia.

Evaluation criterion 2: Quality of the realisation of the research programme

The committee observed that individual members of the consortia often begin independently of each other and only realise the need for more interaction several years later. In some cases the different groups were reorganised, but in other cases this did not turn out to be practical.

The way the consortia were set up was frequently imbalanced, with one group or university dominating. Achieving effective interaction between different groups and disciplines is difficult. It takes a change in culture, and some consortia are better at it than others. It is especially difficult if a consortium is overwhelmingly dominated by a single group. The committee believes that researchers should first have a thorough command of their own field and occupy a strong position in it before being able to determine the value of other disciplines and integrate it into their own research. The solution to achieving interdisciplinarity in research is 'team science', according to the committee, which means a joint effort by experts from various fields to address complex scientific challenges. A number of consortia are already using this approach, as researchers travel back and forth between different institutes and expert groups. The committee acknowledges that this *modus operandi* requires time.

Evaluation criterion 3: Institutional and organisational embedding

The organisational management of the consortia is generally in the hands of a relatively small group at the top, who receive advice from prominent researchers in the consortia. There is often an external (international) scientific advisory board, which has a varying impact on strategy and policy.

It appears that young researchers (PhD students and postdocs) in the first years of their scientific career are barely involved in the organisation of the projects. The same is even true for PIs, who occupy more senior positions, but are not represented on a single executive board.

Training a new generation of researchers is usually done using existing curricula, to which the consortia sometimes add a number of extra elements.

Some consortia have received support letters from their universities that institutional anchoring will take place after the Gravitation programme has ended. However, the universities have not made financial commitments yet, although a number of PIs were given permanent or tenure track positions, with a financial guarantee for the period after the Gravitation funding.

Several consortia use longitudinal cohorts. The committee recommends that the Ministry of OCW consider, at a central level, safeguarding these longitudinal (very long-lasting) cohorts, because it is risky to delegate them to universities entirely.

Evaluation criterion 4: Realisation and budget

In general, the consortia were initially somewhat slow to spend funds. On the one hand, this is attributable to the fact that the consortia could not start immediately after receiving funding in 2012, even though the first instalment had already been paid in 2012. On the other hand, the consortia are highly meticulous in selecting talented researchers. In that case, slow spending is a sign of quality. According to the committee, one of the disadvantages of using up funds quickly, as well as early allocation, is that they reduce the flexibility to respond to new developments during the term of the project.

Evaluation criterion 5: Knowledge utilisation

Knowledge utilization has received relatively little attention in the self-evaluations. The self-evaluations focus mainly on the knowledge utilisation in science itself, namely the training of new talented researchers. In addition, several consortia have developed apps. There is hardly any mention of patents, start-ups, coaching programmes or stakeholder involvement, not even in applied programmes.

A positive exception is the industry advisory council at the Delta ITP consortium. Also, several consortia have developed apps. The consortia have anticipated developments on the Dutch National Research Agenda with varying success.

For that reason, the Committee has advised the management of the consortia to take further steps in the field of knowledge utilization in line with the mission of the Ministry of Education and NWO to stimulate contacts between science and the private sector/industry. In this way, more shape and substance can be given to the aim of the Gravitation programme, i.e. that the selection of excellent consortia leads to forming spear heads for top university research that contributes to the mandate of the top sectors and is in line with the Grand Challenges of the EU framework programmes.

Recommendations per consortium

Consortium Individual Development (CID)

Prolongation of funding

The committee has determined that CID is on the right track to achieve the goals outlined in the Gravitation funding. The committee therefore believes that the consortium should be funded again in the coming five years. However, it does have several recommendations for the consortia. The committee recommends that the consortia report to the governing board of NWO after one year on the implementation of the committee's recommendations. This should also be included as an important element in the final review.

The committee recommends the following:

- **introduce more flexibility to expand management options in the second term**

The vacancies for the second five-year term seem to have been more or less filled. Indeed, a decision was made to go for a number of cohort studies, the research methodologies of which are all but determined. As a result, there are relatively few control options for the second term – despite the fact that uniformity and continuity are the strengths of longitudinal research, in which the most valuable results are only achieved in the long term. The fact that all PIs had to comply in writing with a detailed consortium agreement limits control options even more. The committee views this as a less fortunate development. The committee therefore recommends that CID incorporate more flexibility to facilitate control options in the second term. The consortium could, for example, use CID's solid foundation to apply for external funding that would aspire to innovation and flexibility

- **have the CID and Language in Interaction consortia explore further to what degree it would be useful to amicably share both scientific and organisational insights with each other**

There is not yet enough cross-over between adjoining research areas and Gravitation programmes. The committee stresses the importance of potential cooperation between Gravitation programmes as well, and recommends that the CID and Lil consortia explore to what degree it would be useful to amicably share both scientific and organisational insights with each other.

- **explore opportunities on how to use and transfer knowledge from anonymous data collections**

The committee believes that CID has underestimated the possible applications of the data that it generates. This anonymous data could be of interest to all kinds of parties. At present, the consortium is not focusing enough on these opportunities. The committee recommends that the consortium still consider existing and developing business models of databanks and biobanks of cohorts.

In addition, the committee recommends the following regarding the optional topics (gender diversity, data management and ethics):

- **seek external advice and integrate expertise regarding shared data management**

The scientific advisory board (SAB) cannot exert major influence on the chosen path yet and should examine the evaluation of shared data management in detail. The committee believes that the consortium should attract more expertise regarding shared data management, in order to set this up professionally and therefore use the accumulated research results to their maximum potential. For example, by using a well-known data expert, preferably in the area of linking and analysing data within and between cohort studies.

The committee recommends that CID report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

Language in Interaction (Lil)

Prolongation of funding

The committee has determined that Lil is on the right track to achieve the goals outlined in the Gravitation funding. The committee therefore believes that the consortium should be funded again in the coming five years. However, it has several recommendations for Lil.

The committee recommends the following:

- **have the Lil and CID consortia explore further to what degree it would be useful to amicably share both scientific and organisational insights with each other**

There is not yet enough cross-over between adjoining research areas and Gravitation programmes. Lil has taken the initiative for first meetings with CID and FMS. The committee stresses the importance of potential cooperation between Gravitation programmes as well, and recommends that the CID and Lil consortia explore to what degree it would be useful to collegially share both scientific and organisational insights with each other.

In addition, the committee recommends the following regarding the optional topics (gender diversity, data management and ethics):

- **develop a detailed plan in the second half of the Gravitation funding in the area of data management (FAIR data), which makes use of the expertise of the Max Planck Institute**

The committee is not convinced that the management of huge amounts of data is sufficiently safeguarded yet, in terms of either analysis or expertise and security. Data integration, the linking of formats and the like, results in a substantial amount of data. The committee believes that Lil underestimates how much time and energy good data management takes, that is to say to generate FAIR data: Findable, Accessible, Interoperable and Reusable.

The committee recommends that Lil report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

Delta Institute for Theoretical Physics (Delta ITP)

Prolongation of funding

The committee has determined that Delta ITP is on the right track to achieve the goals outlined in the Gravitation funding. The committee therefore believes that the consortium should be funded again in the coming five years. However, it has several recommendations for Delta ITP.

The committee recommends the following:

- **coordinate mutual responsibilities of the various internal bodies more precisely**

The committee observes that it is not always clear what the responsibilities of the various bodies are and that there remains tension between the responsibilities of the consortium and the participating university institutes (heads of institutes, faculties and deans). The committee recommends that the mutual responsibilities of the various bodies be more precisely coordinated.

- **establish a scientific advisory board**

Delta ITP has come to the conclusion, based on the external review, that there is an urgent need to establish a scientific advisory board in order to validate progress and quality by approving the annual Delta ITP review and budget. Until now, this task was carried out by the supervisory board, but it would be better if these tasks and responsibilities were taken on by an independent body.

- **in the future, attempt to strengthen the industry advisory council in the framework of the cooperation arrangement with experimental physics**

The committee believes that cooperation with experimental physics is already taking place but at an insufficient level. The committee believes this could be a task for an industry advisory council, which can provide input on how to pursue this aim. Cooperation could link two Gravitation projects (Delta ITP and NanoFront) to each other. In this context, the committee recommends that Delta ITP attempt to strengthen the industry advisory council, which currently consists of former physicists from the network of consortium members. Examples include companies such as Philips, ASML, NXP and DSM.

- **ensure that PhD students receive an equal degree of guidance from both supervisors**

PhD positions are created by researchers from different institutes. In practice, the PhD students receive guidance from a single supervisor with only a relatively marginal contribution by the researcher from another institute. The committee believes that this could be a missed opportunity, especially for theoretical physics. It recommends that the consortium therefore ensure that PhD students receive an equal degree of guidance from both supervisors.

- **seek cooperation in European projects**

Currently, international cooperation consists primarily of the international recruitment of researchers, the fellowship programme and an extensive visitor's programme, in which world-leading experts visit the consortium for a short or longer period of time. The committee suggests that Delta ITP also position itself for participation in European projects.

The committee recommends that Delta ITP report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

Prolongation of funding

The committee has determined that CGC.nl is on the right track to achieve the goals outlined in the Gravitation funding. The committee therefore believes that the consortium should be funded again in the coming five years. However, it has several recommendations for CGC.nl.

The committee recommends the following:

- **create some budget flexibility to identify young PIs**

The committee observes that the budgeting has for the most part already been planned and that this could compromise the flexibility to identify and deploy young PIs. It recommends creating some flexibility and also suggests laying the foundation for the next generation(s) of top researchers by

means of start-up packages and tenure tracks for a limited number of very promising researchers, in addition to activities that are already taking place in the participating institutes in this area.

- **support and take more responsibility for the career prospects of young talented researchers**

The committee is concerned about the high dropout rates among talented junior researchers as a result of uncertain career prospects in a highly competitive environment with a strongly hierarchical character. It advises the consortium to take more responsibility for the career prospects of young talented researchers. Currently, there is a danger of a gap emerging between young researchers and more established senior researchers, because of post docs who leave to develop themselves elsewhere.

- **increase the number of meetings and make them more interactive**

The committee recommends that the consortium increase the number of internal meetings within the consortium to encourage interaction between the disciplines: instead of an annual meeting, at least one meeting every three months. Interaction could also be further encouraged by making the format of the meetings more interactive and less focused on presenting progress.

- **involve more clinicians to determine the direction of the research programme**

To promote knowledge utilisation, the committee recommends that more clinicians become involved in the process that determines the direction of the research programme, and that more thought is devoted to the practical/financial consequences of therapies that could potentially lead to a series of (expensive) medicines. This issue requires the leading researchers to be able to adapt in order to focus more on applying models and research results in future clinical settings.

- **identify at this early state inappropriate or non-active groups and take appropriate measures within the possibilities permitted**

Some groups are more strongly linked to CGC.nl than others. According to the consortium, it is still difficult to make a selection at the moment. The committee nevertheless recommends that CGC.nl attempt to activate members at this stage who are not involved in the consortium in question, and if that fails, to adapt budget distribution to the extent that it is possible within the stipulated frameworks.

In addition, the committee recommends the following regarding the optional topics (gender diversity, data management and ethics):

- **put the problem of gender balance permanently on the agenda in order to create more gender balance**

The committee also notices that the contribution of women at the top level of this consortium and the level beneath is extremely limited. The committee asks that attention be devoted to this issue. There is more than enough female talent out there, in particular internationally, in the field in question.

- **organise data management according to the FAIR principle (Findable, Accessible, Interoperable and Reusable), at least regarding the framework conditions**

There is no central data management policy. The consortium has indicated that it will follow the data policy plans of the guest institutes in order to improve data management. The committee does not feel that this is a good way of organising data management and recommends to do this according to the FAIR principles (Findable, Accessible, Interoperable and Reusable), at least regarding the framework conditions.

The committee recommends that CGC.nl report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

Frontiers of Nanoscience (NanoFront)

Prolongation of funding

The committee has determined that NanoFront is on the right track to achieve the goals outlined in the Gravitation funding. The committee therefore believes that the consortium should be funded again in the coming five years. However, it has several recommendations for NanoFront.

The committee recommends the following:

- **establish an industry advisory board**

The committee suggest to establish an industry advisory board similar to that of the Delta ITP consortium. However, NanoFront disagrees in so far that individual PI's have their own discipline-specific network in the industry. As a prominent example QuTech was mentioned, an advanced research center of NanoFront-researchers with industry partners: TNO, Intel and Microsoft. This kind of organ could advise the MT about opportunities in industry that have specific resonance in NanoFront's areas of interest. Therefore, the committee recommends that an industry advisory board be established to formalise contacts with industry, thus also optimising knowledge utilisation.

- **create the opportunity to fully tap into interdisciplinary cooperation**

Although it concerns an interdisciplinary research programme, it seems that individual projects are not making optimal use of the opportunity to engage in the interdisciplinary cooperation that is available in this consortium.

The committee recommends that NanoFront report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

Research Center for Functional Molecular Systems (FMS)

Prolongation of funding

The committee has determined that FMS is on the right track to achieve the goals outlined in the Gravitation funding. The committee therefore believes that the consortium should be funded again in the coming five years. However, it has several recommendations for FMS.

The committee recommends the following:

- **attempt to enhance cooperation in European projects**

The three institutes in question are world-class institutes, each of which occupies a recognised, leading international position. The FMS consortium has a great deal to offer at the international level: an international composition, organising international symposiums and workshops, and drawing international top researchers. The Netherlands provides these top talents with an extremely suitable spot to carry out scientific research in a pioneering scientific environment. Moreover, these three institutes would help the consortium to put itself on the international job market. In that light, it is remarkable that cooperation is still lacking at the European level. The committee therefore recommends that more attention be devoted to making this objective happen.

- **establish an industry advisory board**

FMS has effective contacts and cooperation with the industry. Industry is now more aware of the importance of this field, in part thanks to the visibility of the Gravitation consortium and another area of focus, namely the 'next level in the area of functional molecular systems'. FMS's PIs are also involved in the recently founded Advanced Research Center Chemical Building Blocks Consortium (ARC CBBC), to which AkzoNobel, BASF, Shell, the Ministry of Economic Affairs, the Chemistry Top

Sector, NWO and the universities in Utrecht, Eindhoven and Groningen have pledged a multi-year commitment. In light of this, the committee recommends that FMS establish an industry advisory board to formalise contacts in the business sector, thus also optimising the knowledge utilisation.

The committee recommends that FMS report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

1 Gravitation

1.1 About the programme

The Dutch Ministry for Education, Culture and Science (Dutch acronym OCW) has made a total of M€ 50 per year available for a new selection and boosting of research consortia that already belong to the absolute world top in their research field or have the potential to do so. This programme has previously existed under the name "Bonus incentive scheme for research schools".

The policy instrument "Bonus incentive scheme for research schools" was set up at the end of the 1990s. The aim of the instrument was to "identify and boost national centres of excellent scientific research in research schools". Via the "Bonus incentive scheme for research schools" OCW awarded funding to six top research schools based on NWO's advice, which followed a strict selection for quality. Since 1998 these schools have repeatedly received a positive evaluation due to the contribution they make to the national coordination of excellent research in their field. The last evaluation was conducted by NWO in 2010 and during this two of the six research schools received the designation "exemplary" (Zernike and Nova) and the other schools the designation "excellent".

No new selection rounds had been held since 1998 and consequently no new research schools had been awarded funding. The instrument had therefore become somewhat rigid and so in 2009, the then Minister for Education, Culture and Science, Plasterk, asked the Royal Netherlands Academy of Arts and Sciences (KNAW) to issue an advice about how to make the instrument more flexible. Based on a broad national and international consultation, the KNAW published its advice to OCW in which it recommended the continuation and expansion of the instrument. OCW broadly adopted the advice and requested NWO to further elaborate the programme.

In the Strategic Agenda for Higher Education, Research and Science Policy "Quality in diversity" the then State Secretary for Education, Culture and Science, Zijlstra, had made M€ 20 available for top research schools. Together with the available budget of M€ 30 the total budget for the new instrument was M€ 50 per year. This innovative instrument continued under the name Gravitation. The excellent consortia to be selected must lead to a profiling of university top research and with this also make contributions to the Top sectors and the grand challenges of the EU Framework Programmes.

1.2 About the evaluation

Grants were awarded for a period of ten years, with an interim evaluation taking place in the fifth year. The decision to confirm the award of grant for the second five-year period was to depend on the outcome of the interim evaluation.

The interim evaluation of the top research schools was conducted in 2015–2016 on the basis of the protocol appended to this document (appendix 1). The protocol specifies the aim of the interim evaluation and the assessment criteria, procedure and timetable to be observed during it. In addition, it provides guidelines for the selfevaluation document, including the appendices to accompany it (appendix 2).

Wherever possible, the protocol adheres to the Standard Evaluation Protocol (SEP 2015–2021) for the evaluation of Dutch universities and research institutes managed by the Royal Netherlands Academy of Arts and Sciences (KNAW) and NWO.

The protocol further adheres to the selection criteria of the 2012 call, translated to the following evaluation criteria:

- 1 Participating researchers
- 2 Quality of the realization of the research programme
- 3 Institutional and organisational embedding
- 4 Realisation and budget¹
- 5 Knowledge utilization

Because the projects run 2.5 to three years at the time of the evaluation, there is likely too little output to base a judgment. An opinion on the quality of the researchers has been given at the selection in 2012. Therefore, the evaluation focusses on the quality of the implementation of the submitted research projects: how did the projects get off the starting blocks? Are they on the right track to such and extent that it can be expected that the objectives will be achieved?

Co-funding will be disregarded in the assessment, in line with the NWO cadres of 2012. However, it is an important aspect of policy on which both OCW and NWO like to receive information. The data provide a picture of the different possibilities of co-financing between the consortia.

Questions about gender diversity, data management and ethics are optional and will also be excluded from the assessment.

1.3 Design of the evaluation

NWO set up an evaluation committee to conduct an independent external evaluation of the six research consortia (appendix 3). This committee was asked to advise the Governing Board of NWO whether the Gravitation grant should be continued for each of the research consortia. The Governing Board would then advise the Minister of Education, Culture and Science.

The committee had to be composed of internationally recognised Dutch researchers in the research consortia particular field of study. The members were to have no direct personal connection with the research consortium and had to be in a position to form an independent opinion.

The committee:

- should be capable of assessing the research unit's management;
- should be capable to reflect on the research unit's talent management;
- should have a good knowledge of and experience working with the Dutch research system, including the funding mechanisms;
- should be impartial and maintain confidentiality.

In order to enable the committee to perform the midterm evaluation, each of the consortia was asked to prepare a self-evaluation document.

The following timetable covers the entire period of the interim evaluation up to and including the Minister's decision.

¹ Not a separate selection criterion, but part of the application.

Timetable midterm evaluation

March – June 2015	Finalisation of evaluation protocol
June 2015 – April 2016	Preparation of self-evaluation documents by NRCs
30 April 2016	Deadline for delivery of self-evaluation documents
May 2016	Documents forwarded to committee
June 2016	Meeting of committee and interaction with research consortia
October 2016	Presentation of committee report to NWO Decision by NWO Governing Board (26 October 2016) Presentation of report by NWO to Minister of Education
November 2016	Decision by Minister of Education
January 2017	Commencement of second period of Gravitation

In drawing up the plan NWO took into account that the actual financing ends by the end of 2017, so that in the event of a negative decision on continuation the consortia will get sufficient time to finalize its project.

2.1 Procedure

In a closing session on June 10th, the committee also discussed some issues of more general concern with regard to Gravitation.

In general, the committee is satisfied with how the vacancies were filled. The consortia have generally succeeded in attracting top talents and researchers. An impressive example and best practice in attracting top talents and hence an investment in the future, according to the committee, is the provision of a 'start-up package' for the carefully selected principal investigators (PIs), consisting of a PhD student, a postdoc and a substantial material budget, in order to set up a laboratory. Tenure track positions and/or permanent positions have enabled Consortium Individual Development (CID), Delta-Institute for Theoretical Physics (Delta ITP), Language in Interaction (LiI) en Frontiers of Nanoscience.

(NanoFront) to successfully anchor themselves in the universities in question. Research Center for Functional Molecular Systems (FMS) has also succeeded in doing this, even though the tenure track positions are not part of the Gravitation funding instrument.

It is worth noting that in consortia with less space for people in their mid-career (30–40 years old) to develop themselves, a gap could potentially emerge between the really young researchers and those in the age group of 40–50 years and older as the middle layer departs (e.g. CancerGenomiCs Netherlands, CGC.nl).

Although it was not an evaluation criterion during the evaluation, the committee observed that the consortia handle gender diversity in different ways. In general, more male than female researchers work at the consortia, except at CID. Some consortia have successfully implemented a gender-specific policy while recruiting researchers, whereas the issue is less of a priority for other consortia.

Evaluation criterion 2: Quality of the realisation of the research programme

The committee observed that individual members of the consortia often begin independently of each other and only realise the need for more interaction several years later. In some cases the different groups were reorganised, but in other cases this did not turn out to be practical.

The way the consortia were set up was frequently imbalanced, with one group or university dominating. Achieving effective interaction between different groups and disciplines is difficult. It takes a change in culture, and some consortia are better at it than others. It is especially difficult if a consortium is overwhelmingly dominated by a single group. The committee believes that researchers should first have a thorough command of their own field and occupy a strong position in it before being able to determine the value of other disciplines and integrate it into their own research. The solution to achieving interdisciplinarity in research is 'team science', according to the committee, which means a joint effort by experts from various fields to address complex scientific challenges. A number of consortia are already using this approach, as researchers travel back and forth between different institutes and expert groups. The committee acknowledges that this *modus operandi* requires time.

Evaluation criterion 3: Institutional and organisational anchoring

The organisational management of the consortia is generally in the hands of a relatively small group at the top, who receive advice from prominent researchers in the consortia. There is often an external (international) scientific advisory board, which has a varying impact on strategy and policy.

It appears that young researchers (PhD students and postdocs) in the first years of their scientific career are barely involved in the organisation of the projects. The same is even true for PIs, who occupy more senior positions, but are not represented on a single executive board.

Training a new generation of researchers is usually done using existing curricula, to which the consortia sometimes add a number of extra elements.

Some consortia have received support letters from their universities that institutional anchoring will take place after the Gravitation programme has ended. However, the universities have not made financial commitments yet, although a number of PIs were given permanent or tenure track positions, with a financial guarantee for the period after the Gravitation funding.

Several consortia use longitudinal cohorts. The committee recommends that the Ministry of OCW consider, at a central level, safeguarding these longitudinal (very long-lasting) cohorts, because it is risky to delegate them to universities entirely.

Evaluation criterion 4: Realisation and budget

In general, the consortia were initially somewhat slow to spend funds. On the one hand, this is attributable to the fact that the consortia could not start immediately after receiving funding in 2012, even though the first instalment had already been paid in 2012. On the other hand, the consortia are highly meticulous in selecting talented researchers. In that case, slow spending is a sign of quality. According to the committee, one of the disadvantages of using up funds quickly, as well as early allocation, is that they reduce the flexibility to respond to new developments during the term of the project.

Evaluation criterion 5: Knowledge utilisation

Knowledge utilization has received relatively little attention in the self-evaluations. The self-evaluations focus mainly on the knowledge utilisation in science itself, namely the training of new talented researchers. In addition, several consortia have developed apps. There is hardly any mention of patents, start-ups, coaching programmes or stakeholder involvement, not even in applied programmes. A positive exception is the industry advisory council at the Delta ITP consortium. Also, several consortia have developed apps. The consortia have anticipated developments on the Dutch National Research Agenda with varying success.

For that reason, the Committee has advised the management of the consortia to take further steps in the field of knowledge utilization in line with the mission of the Ministry of Education and NWO to stimulate contacts between science and the private sector/industry. In this way, more shape and substance can be given to the aim of the Gravitation programme, i.e. that the selection of excellent consortia leads to forming spear heads for top university research that contributes to the mandate of the top sectors and is in line with the Grand Challenges of the EU framework programmes.

Despite this positive overall judgement, the committee wishes to make some specific recommendations for individual consortia. These are specified in section 3 of the report. The recommendations are intended to further enhance the position of the consortia and to make it possible for them to benefit fully from the second phase of the Gravitation funding. The response of the consortia to the recommendations in this report should be reported to the governing board of NWO after one year and constitute an important element of the final review.

2.3 General remarks on Gravitation

Certain major issues emerged repeatedly in the committee's consultations and deliberations. The importance of these issues is such that the committee has decided to draw attention to them in the following general remarks.

Evaluation time period

When the evaluation took place, the consortia had only been operational for 2.5 to 3 years. This is too early to make an assessment of the research results. Nevertheless, in line with the governing board of NWO, the committee considers this time period correct, in light of the fact that it is not the quality of the output being evaluated but the essential components of the workings of the consortia, namely multidisciplinary interaction, also between institutes in different locations and the structural measures that encourage this, sustainability in terms of developing talent that results in various positions within the institution without a succession of temporary grants, the commitment of the universities and knowledge utilisation.

Added value of Gravitation funding

The evaluation committee believes that the funding of the consortia through Gravitation is the cement that holds together the variations in the spectrum of knowledge in the fields of expertise, with the aim of initiating and implementing truly innovative and high-risk projects. It is the foundation and the catalyst. The added value of the Gravitation programme for consortia that already receive substantial funding is less obvious than it is with consortia that have been recently established. Flexibility has largely been eliminated in the present university funding system (by reducing the first flow of funds and many fixed deliverables via the second flow of funds), which has restricted the freedom to carry out scientific research that responds to new developments and insights. Thanks to Gravitation funding it is nonetheless possible to conduct high-level, innovative research with a relatively high degree of risk (high risk, high gain).

3 Committee reviews per research consortium

3.1 Consortium on Individual Development (CID): Why some children thrive and others do not

3.1.1 Introduction

The Consortium on Individual Development (CID) involves researchers from Utrecht University (applying university), University Medical Center Utrecht, University of Amsterdam, Leiden University, University Medical Center Groningen, Erasmus University Medical Center Rotterdam, Radboud University Nijmegen, and VU University Amsterdam.

Mission

The proposed Consortium on Individual Development (CID) aims to build a comprehensive model of how developmental differences between children arise as a result of the interplay of child characteristics and environmental factors, by filling crucial knowledge gaps on the role of brain development, effects of interventions in the environment, and intergenerational transmission.

Research programme

Over the past years, the consortium has grouped research into four work packages (WPs), each focusing on specific aspects of development: the role of brain development in WP1, effects of interventions in WP2, the role of generational transmission in families in WP3, and animal and mathematical models of development in WP4.

In addition, two new study cohorts have been set up, to provide longitudinal data: a longitudinal cohort based in Utrecht (YOUth, WP1) and an intervention cohort based in Leiden (L-CID, WP2). In addition, WP3 makes use of four existing cohorts: TRAILS (Groningen), Generation-R (Rotterdam), RADAR (Utrecht), and NTR (Amsterdam). In each cohort a specific subset of measures is used to monitor the development of two aspects of behavior, namely, social competence and behavioral control, skills that are needed for functioning in society and for reducing the risk of behavioral and emotional problems. Social competence is the ability to engage in meaningful interactions with others. Behavioral control is the ability to control one's emotions, behavior, and impulses and to adapt to rules.

In addition to the subset of measures for social competence and behavioral control, several instruments are used in all cohorts, thereby allowing (partial) integration of datasets. This broad (social sciences, humanities, biomedical/medical sciences) yet focused multigenerational approach is unique.

Scientific models

See appendix 5.

Personnel

CID filled vacancies as planned. As of February 1 2016 CID consists of 20 PIs, 25 PhD students, 26 postdoc and 8 other CID researchers; thus there are 51 junior scientists each supervised by at least two PIs. Thirty-seven researchers (17 PhD students, 18 post docs and two researchers) are financed through the CID budget; 22 researchers are supported by co-funding budgets. In addition to the original plan 17 more PhD students, postdocs, and researchers have been appointed through co-funding budgets.

Finance

Under Gravitation, CID was awarded a total budget of M€ 14.8 for the first five-year period. The external money attracted by CID for its research programme for the 2013-2015 period amounted to a total of M€ 6.7. The percentages spent of the Gravitation budget for the first three years are:

Personnel	45%
Investments	54%
Other costs	–%
Total	50%

SWOT

Strengths

- CID community: broad expertise and enthusiasm
- Joint instruments: unique cohorts
- Organisation: transparent and efficient
- National and international embedding
- Well-developed talent management and strong investments in junior scientists

Weaknesses

- Timing: starting-up cohorts
- Financing of cohorts

Opportunities

- Science is changing
- Funding possibilities

Threats

- Governmental regulations for data handling

3.1.2 The committee's comments and criticisms

Participating researchers

The committee observes that because substantial investments were made to set up new cohorts it has been difficult to make any consequential investments in the selection of young talent as a basis for a new generation of top researchers. Utrecht University has chosen the research area of this consortium as a strategic theme (Dynamics of Youth) and has therefore made several permanent positions available. Leiden University has also made a number of permanent positions available, because the tenure track system has not been put into use yet at this social and behavioural sciences faculty. Putting in place a tenure track system also within the social and behavioural sciences faculties as part of talent management policies is a good option, according to the committee. Elsewhere there are positive experiences with such a tenure track system, while it is also a wish of the consortium.

It is striking that the vacancies are usually filled by promising Dutch master's students. The influx of international students is starting to take off but has not been quantified yet.

Although it is not mandatory to provide information about gender diversity during the current evaluation, the gender diversity in this consortium is completely unique in Dutch science, in the sense that 55% of the PIs and approximately 80% of the PhD students and postdocs are women.

Future

The vacancies for the second five-year term seem to have been more or less filled already. Since a decision was made to go for a number of cohort studies, of which the research methodologies are all but determined. The committee finds it regrettable that this could potentially restrict flexibility and control options. On the other hand, uniformity and continuity are the strengths of longitudinal research (that is, research that involves repeated measurements carried out in the same way in order to identify developmental trends). The fact that all PIs had to comply in writing with a detailed consortium agreement limits control options even more. The committee views this as a less fortunate development. The committee therefore recommends that CID incorporate more flexibility to facilitate control options

in the second term. The consortium could, for example, use CID's solid foundation to apply for external funding to pursue innovation and flexibility.

Quality of lines of research

Interacting and coherence between the lines of research

Multidisciplinarity at CID is alive and well according to the committee because the consortium is divided into four carefully defined research programmes, all of which work well together both within and between the programmes. The most important thing about this research programme, however, is the decision to go for a number of cohort studies. On the one hand, new cohorts were established: YOUTH and L-CID. On the other hand, CID is also using existing cohort studies elsewhere in the country: TRAILS, Generation-R, RADAR and NTR. Moreover, the committee believes it is special and positive that in addition to these cohort studies with humans CID opted to set up cohorts with animals as well. This has great scientific added value. The committee also believes that significant steps are being made methodologically and statistically to achieve coherence between the lines of research. A number of unique observations have been made in the various cohorts, for example through the use of MRI in brain development.

Institutional and organisational embedding

Institutional and organisational embedding appears solid and seems to be functioning well (appendix 5). This embedding is largely assured as the consortia are using longitudinal cohorts. It is therefore expected that the most groundbreaking scientific results will take place in the second five-year term, and that the output will continue afterwards.

External quality assurance

The committee considers the quality assurance of the research in the cohorts to be guaranteed. The consortium has opted for identical standardised tools to measure a number of aspects related to the individual development of children. These tools have been internationally validated and accepted, and have proven replicable. The consortium has begun to use shared data management. This is taking place via the FAIR principle (Findable, Accessible, Interoperable and Reusable). This will also greatly enhance the reproducibility and reliability of the outcomes.

Scientific advisory board

The scientific advisory board (SAB) has not convened frequently; the last meeting was on 9 April 2015. The report has been included in the self-evaluation. Therefore the SAB has not exerted much influence on the chosen path yet and should examine the evaluation of shared data management in detail. The committee therefore believes that the consortium should also attract expertise regarding shared data management.

Cooperation

Embedding and cooperation are broad and deep – almost all top researchers in this field in the Netherlands are participating. There does not seem to be any cross-over between adjoining research areas and Gravitation programmes yet. The committee stresses the importance of potential cooperation between Gravitation programmes. It recommends that the CID and Lil consortia explore to what extent it would be useful to collegially share both scientific and organisational insights with each other. International alliances are less clear, but foreign researchers seem more interested in the unique longitudinal data than they are in providing support.

Capacity building

Young talents receive good training at the local graduate schools. In addition, CID provides a set of discipline-related specific activities for PhD students and postdocs. Moreover, PhD students are prepared for a career inside or outside academia. The participating institutes of the universities also organise an annual international summer school. The committee stresses the importance of using this consortium to

support PhD students from the start with two PIs, if possible from two programmes. CID evaluates which meetings the PhD students and postdocs find useful and what they feel may be lacking.

Anchoring

The committee has some doubts about anchoring. On the one hand, it is assured by the choices of strategic themes of the universities and because it coincides with the Dutch National Research Agenda. On the other hand, there is a real risk that too many valuable cohorts must be kept running or initiated in the coming years. It therefore seems necessary that the Dutch government give this issue consideration.

Realisation and budget

The committee observes that CID's expenses are in accordance with the budget, but that it is slightly lagging behind in terms of budgetary spending. The committee believes that this careful spending pattern is a sign of quality, because it reflects a selective recruitment policy of excellent researchers.

Knowledge utilisation

CID develops apps, and according to the committee the application of the knowledge developed by the consortium has still more potential in the medical field. Normative data (that is to say, data that characterise what is habitual in a certain population at a given point in time or period of time) of validated questionnaires, and MRIs, for example, could be used to determine abnormal development and developmental disorders. Currently, CID is considering whether or not to make public the automated system of MRIs. The consortium believes it is important to make the outcomes of publicly funded research accessible, an opinion which the committee fully endorses.

The committee believes that CID underestimates the possible applications of the data and methods the consortium is generating. Anonymous data can be of interest to all kinds of parties. At present, the consortium is not focusing enough on these possibilities. The committee recommends that the consortium explore possibilities of marketing anonymous data and suggests that the consortium look into business models for genetic data. The committee observes a lack of stakeholder participation.

SWOT

An inherent part of longitudinal cohort studies is that the research methodology is essentially predetermined and, as mentioned above, this could potentially restrict flexibility in terms of innovation. As a result, there are relatively few control options for the second term.

General conclusion

Based on the available information, the committee recommends that Gravitation funding be prolonged for five years. However, it has several recommendations for CID.

Recommendations

The committee recommends the following:

- introduce more flexibility to expand management options in the second term
- have the CID and Lil consortia explore further to what degree it would be useful to collegially share both scientific and organisational insights with each other
- explore opportunities on how to use and transfer knowledge from anonymous data collections

In addition, the committee recommends the following regarding the optional topics (gender diversity, data management and ethics):

- seek external advice and integrate expertise regarding shared data management (in addition to advice from the scientific advisory board)

The committee recommends that CID report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

The committee also recommends that the ministry of OCW consider, at a central level, safeguarding these longitudinal cohort studies, because it is risky to delegate them to universities entirely.

2.7 Language in Interaction Consortium (LII)

2.7.1 Introduction

Language in Interaction brings together researchers from the University of Amsterdam, Leiden University, Erasmus University Rotterdam, UMC Utrecht, Tilburg University, Radboud University (applying university) and Radboud UMC, Max Planck Institute for Psycholinguistics, and Maastricht University.

2.7.2 Mission

The overarching aim of the programme can be summarized as accounting for the variability in languages and linguistic skills, and their boundary conditions, namely the constraining universals. Thus, to get an integrated explanation of how this extraordinary foundation for human culture and social life can have the properties that are so distinctive: a wide diversity of cultural patterning on a universal biological substrate.

Insights into universality and variability will not be gained if we study language at just one level of description and explanation. Language in Interaction is characterized by structured interaction between experts in all domains of language research (from genetics up to cultural contributions) and combines this with insights about different cognitive systems that are in continuous interaction with language.

2.7.3 Research programme

From the start the research programme has been organized into seven work packages (WP; see below). However, the WPs were only initiated to enable a clear and goal-directed management by providing an organizational backbone based on a decomposition of the human language faculty in its key components. On research level, the WP-structure was never intended as a straitjacket in defining the main research lines, but offering a framework for organizing the research. The decomposition and distribution of labour between WPs does not hinder the interaction between individual members. Rather, the organization of the research promotes interactions as much as possible. Each member is expected to contribute to the multiple research projects transcending WPs.

- WP 1 – Speech perception and production
- WP 2 – Semantic and conceptual basis
- WP 3 – Compositionality and contextuality
- WP 4 – Language in interaction
- WP 5 – Language evolution and diversity
- WP 6 – Toolkit
- WP 7 – Utilization

2.7.4 Appendix 5

See appendix 5.

Personnel

Overview	Realisation in 2013-2016
Tenure track	3
Junior PI	1
PD positions	7
PhD positions	24

Finance

Under Gravitation, Lil was awarded a total budget of M€ 16.7 for the first five-year period. The external money attracted by Lil for its research programme for the 2013-2017 period amounted to a total of M€ 4.5. The amounts spent of the Gravitation budget for the first three years are (in percentages):

Personnel	65%
Investments	33%
Other costs	23%
Total	50%

SWOT

Strengths

- Excellent science
- Flat and transparent organizational structure
- Control over progress through internal calls
- Extensive meeting structure
- Quality of individual members
- Excellent infrastructure
- Multi-level possibilities for interdisciplinary research
- Appeal to the next generation of ambitious scientists

Weaknesses

- Implicit inclusion of only established scientists at start consortium
- Involvement of individual members
- Gender balance

Opportunities

- Opportunity for genuine innovation, solving major outstanding questions
- Opportunity to populate the field with new type of scholar
- Increased likelihood of acquiring future grants

Threats

- Complexity of future research and current grant schemes
- Financial challenges faced by Dutch Universities

5.2.2 The committee's comments and criticisms

Participating researchers

The committee observes that the Lil consortium has consciously sought visibility by means of several measures, international conferences and international advertisements. As a result, the consortium has succeeded in hiring talented researchers from the international market. A number of tenure track positions have been created.

The consortium has observed that not all PIs originally involved in the consortium took active part in the first three years. This will lead to the redeployment of PIs and create an opportunity to involve young researchers who have not participated in the consortium yet, a development which the committee commends, because it demonstrates the consortium's ability to adapt to changing circumstances.

Although it is not mandatory to provide information about gender diversity during the current evaluation, From the start, Lil has implemented a gender-specific policy, as a result of which the percentage of female researchers has risen from 17% during the application process to 35% in early 2016, which the committee considers an impressive increase.

Quality of the lines of research

At the start of the project, there were seven work packages (WPs). Meanwhile, Lil has abandoned the original plan, and the consortium is focusing on the five 'big questions' that link the WPs. The seven WPs still remain the backbone of the project. This decision was intended to penetrate the seven WPs' insulation and increase the programme's coherence. According to the committee, this will also promote multidisciplinary more.

Institutional and organisation embedding

The committee has observed that the consortium has a well-functioning organisational structure (appendix 5). The committee does not object to the fact that the Nijmegen branch plays a more dominant role. Since it is the Gravitation programme's aim to bring together excellent researchers. In this case, there is a large concentration of institutes from Nijmegen.

The committee observes that the entire team is involved by the management in determining which direction to follow. Spinoza laureates and other top researchers also keep the management in a sharp focus.

Lil has an active scientific board and a scientific advisory board, both seem to be functioning well, according to the committee. The report of the scientific advisory board has been included in the self-evaluation report.

Data management²

The committee is very impressed with the plans to develop a normative phenotyping (collection of all observable characteristics) of normal speech development in humans. The first steps are promising, but the committee is not convinced yet that the management of huge amounts of data is sufficiently safeguarded, in terms of either analysis or expertise and security. Data integration, the linking of formats and the like, results in a substantial amount of data. The committee believes that Lil has underestimated how much time and energy good data management takes, that is to say to generate FAIR data: Findable, Accessible, Interoperable and Reusable. Lil is able to make use of the existing expertise on this topic from their staff and the supporting institutes. A large part of Lil is carried out at the Donders Institute, which is the first institute of the Radboud University where a pilot of implementation of their Research Data Management system has started. Data management requires specific expertise which the committee recommends to be incorporated further into the consortium.

Despite the fact that the majority of institutes connected to the consortium are from Nijmegen, the committee believes that a dynamic has been created by the long-term expertise of a number of other institutes in the country, including the University of Amsterdam (computational modelling), Maastricht University (auditory cortex) and Tilburg University (iconic signing).

Lil is moving towards team science, in which the traditional individual approach gradually transitions into a format in which experts from different fields work together to address complex scientific challenges. The committee welcomes this development very much. It views this working method as a chance to break through the pattern of researchers working individually.

Cooperation in the consortium has already led to the forthcoming publication of the new *Human Language: from Genes and Brains to Behaviour* handbook, to be published by MIT Press, which the committee considers to be world class.

² Data management was not one of the evaluation criteria in the 2012 call.

Lil has taken the initiative to inform the other Gravitation consortia by sending them their annual reports and for first meetings with CID and FMS. The committee stresses the importance of potential cooperation between Gravitation programmes as well, and recommends that the CID and Lil consortia explore further to what degree it would be useful to collegially share both scientific and organisational insights with each other.

The consortium has many international alliances, including those obtained via the Max Planck Institute in Nijmegen, one of the few Max-Planck-Gesellschaft research institutes outside of Germany.

Talent management

The training of PhD students has a strong foundation, according to the committee, and makes use of existing structures. PhD students and postdocs are given a voice, which the committee considers extremely important. With this aim in mind, an educational team was set up with representatives from the different graduate schools. In addition to the mandatory courses, PhD students can compile their own training programme. Moreover, there are various other activities, including retreats with a team-building component, summer schools and workshops.

Anchoring

Anchoring of the Lil consortium is guaranteed because this field is a key area at both Radboud University Nijmegen and the Max Planck Institute. The tenure track positions that have been set up are an important initiative to anchor the consortium's research. As a condition for allocation, the participating institutes have signed agreements that guarantee the funding of these tenure track positions after the first four years (by means of matching and structurally).

Realisation and budget

The committee observes that Lil's expenses are in accordance with the budget, but that it is slightly lagging behind in terms of budgetary spending. The committee believes that this careful spending pattern is a sign of quality, because it reflects a selective recruitment policy of excellent researchers.

Knowledge utilisation

Lil develops apps and wrote the handbook mentioned above, and according to the committee the application of knowledge developed by the consortium has enormous potential in the medical field. Normative data could be used for disorders. The committee observes a lack of stakeholder participation.

SWOT

The lack of involvement by individual members of the consortium is being effectively addressed by redeployment, according to the committee. The committee is extremely enthusiastic about attempts to create a gender balance. It is concerned, however, about the complexity of the consortium's future research, in particular the complexity of data management. Incidentally, both gender diversity and data management are not being taken into consideration in the present evaluation.

General conclusion

Based on the available information, the committee recommends that Gravitation funding be prolonged for a period of five years. However, it has several recommendations for Lil.

Recommendations

The committee recommends the following:

- have the Lil and CID consortia explore further to what degree it would be useful to collegially share both scientific and organisational insights with each other

In addition, the committee recommends the following regarding the optional topics (gender diversity, data management and ethics):

- **develop a detailed plan in the second half of the Gravitation funding in the area of data management**

The committee recommends that Lil report to the governing board of NWO after one year on the implementation of the recommendations from the committee. This should also be included as an important element in the final review.

Delta-Institute for Theoretical Physics (Delta ITP)

1.1 Introduction

The Delta-Institute for Theoretical Physics unites the existing institutes for theoretical physics of the University of Amsterdam (applied university), Leiden University, and Utrecht University. The associated scientists are determined to continue their tradition of scientific excellence by attacking the grand challenges of modern physics and by attracting a new generation of top talent.

Mission

The research program of the Delta Institute for Theoretical Physics is driven by the conviction that theoretical physics can play a unifying role in the exploration of matter at all scales, because the same mathematical concepts and techniques can apply to vastly different physical situations. The history of physics shows that breakthroughs in our understanding quite often result from a description that unifies what was previously disjoint. This motivates the consortium to join forces and attack problems that have resisted solution for decades.

Research programme

Delta ITP research program into new states of matter is divided into three themes:

- I **Cosmological matter** – from black holes to Dark Matter (*Achúcarro, Arutyunov, Bertone, Boyarsky, 't Hooft, Laenen, Vandoren, Verlinde*)
- II **Quantum matter** – from hot superconductors to cold atoms (*De Boer, Caux, Duine, Morais Smith, Schalm, Stoof, Zaanen*)
- III **Topological matter** – Majorana fermions and beyond (*Beenakker, Van Roij, Schoutens, Turner, Vitelli*)

For each theme the consortium has listed the main contributors, but most of the applicants will contribute to more than a single theme. This is possible because the diverse range of physics topics, with challenges from the subatomic to the cosmic scale, finds common ground in the main mathematical methods and physical concepts that will be used in the program:

- Quantum gravity and string theory, with the concepts of holography and gauge-gravity (or AdS/CFT) duality.
- Quantum information, with the concepts of entanglement and emergence.
- Quantum field theory, with the concepts of supersymmetry and topological invariants.

As the adjective “quantum” indicates, these methods originate from the sub-atomic quantum mechanical world, but their range of applicability extends into the macroscopic world, such as the “soft” matter considered in theme III.

Summary/leadword

See appendix 5.